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AIR FORCE

The Magazine of Aerospace Power / Published by the Air Force Association

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THE FIRST

WORLD CONGRESS OF FLIGHT

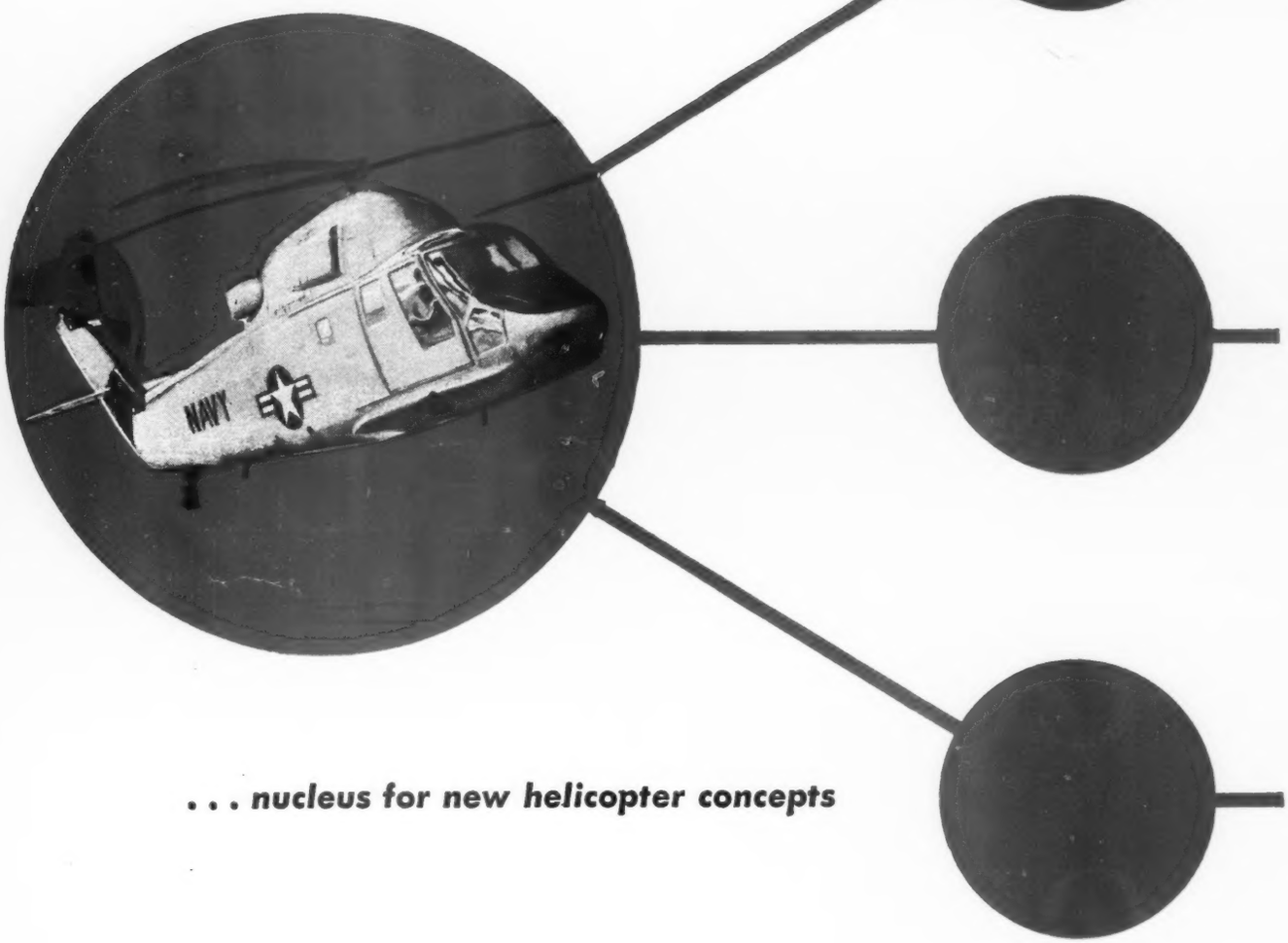
Las Vegas

Nevada

April 12-19

1959

KAMAN HU2K-1



. . . nucleus for new helicopter concepts

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- All-metal servo-flap rotors
- In-flight rotor tracking
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Pioneers in turbine powered helicopters . . . and new helicopter concepts.

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WORLD CONGRESS OF FLIGHT

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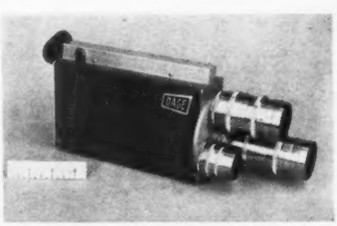

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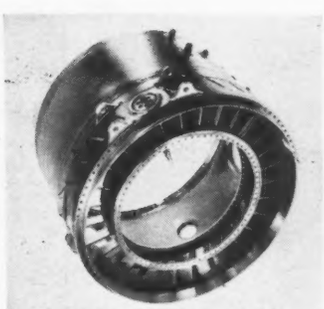

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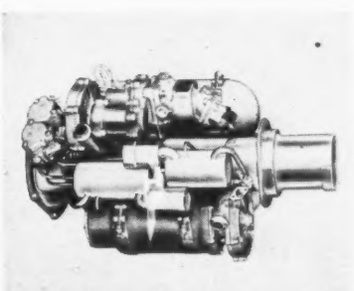

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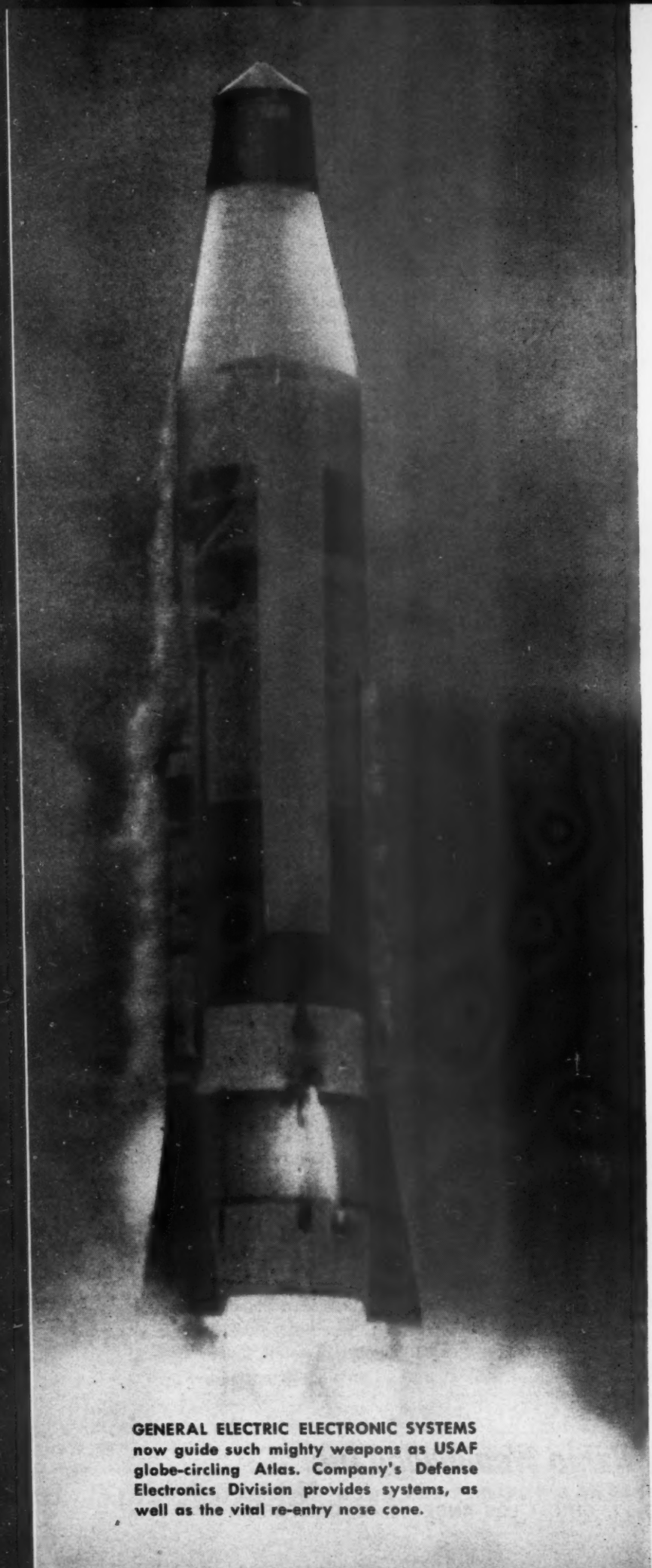

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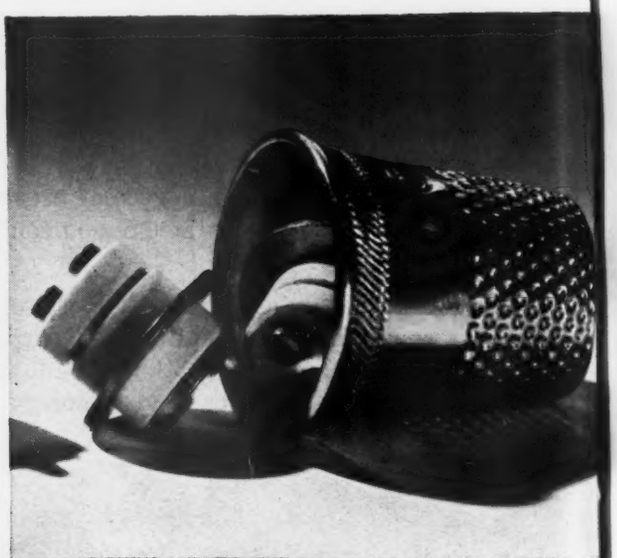

GENERAL ELECTRIC CERAMIC TUBES answer a critical need for small size, ruggedness, reliable UHF performance in radar, communications and navigation systems. Developed and built by the Electronic Components Division.

ORGANIZED FOR DEFENSE

HOW GENERAL ELECTRIC HELPS MEET AMERICA'S NEED FOR A MORE BUSINESSLIKE APPROACH TO U.S. DEFENSE EFFORT

The complex defense equipment shown on these pages is a good example of the skills, experience and economic resources which must be brought to bear on today's defense effort. Of course, marshalling these for top efficiency is a vast organizational problem. This is why General Electric has a special group of departments—the Electronic, Atomic and Defense Systems Group—organized to devote a large portion of their energies to defense research, development and production.

50,000 PEOPLE, 22 PLANTS

The Group employs more than 50,000 persons, for example, including over 50% of the Company's scientists and engineers. They work at 22 plant locations. Many of the facilities they use were built by G.E. for defense work; others are owned by the government, operated by G-E personnel. Naturally, the Group puts its special skills to work in areas that count: products range from powerful helicopter gas turbines to aircraft engine starters, from radar sets to electronic tubes. Divisions in the Group are Atomic Products, Defense Electronics, Electronic Components, Flight Propulsion, and Industrial Electronics.

Why has General Electric made such an effort to organize its manpower and facilities for defense? The answer lies in the new status of the defense industry: defense can no longer be conducted as a temporary, emergency effort. And, as a permanent part of our economy, defense must now, more than ever before, be conducted on a businesslike basis.

The Electronic, Atomic and Defense Systems Group is General Electric's way of meeting an obligation which rests on the entire government-industry community: the necessity for a well-organized approach which will help provide maximum U.S. security at minimum cost.

695-3

GENERAL ELECTRIC

GENERAL ELECTRIC ATOMIC DEVELOPMENTS, many initiated by the Atomic Products Division, support Navy's nuclear program, in addition to USAF A-plane program. U.S.S. *Triton*, world's largest sub, will be powered by G-E reactors, as will new USN destroyer.

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THE MAGAZINE OF AEROSPACE POWER

Volume 42, Number 4 • April 1959

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An Editorial

More Answers Needed

John F. Loosbrock, Editor

AT THE risk of being guilty of lese majesty, it is impossible to allow AIR FORCE/SPACE DIGEST to go to press this month without a comment on the President's speech of March 16, which concerned the Berlin situation and the over-all condition of our defenses—present and future.

Our position on Berlin was summed up succinctly:

"We will not retreat one inch from our duty. We shall continue to exercise our right of peaceful passage to and from West Berlin. We will not be the first to breach the peace; it is the Soviets who threaten the use of force to interfere with such free passage. We are ready to participate fully in every sincere effort at negotiation that will respect the existing rights of all and their opportunity to live in peace."

We can find no quarrel with this position nor with the President's outline of the role of mutual security and the contributions of other free nations of the world to the military posture of the anti-Communist coalition.

We feel constrained, however, to point out some undiscussed factors which must be taken into consideration in evaluating our defense effort, now and for the future.

In the missile field, the President said that "today there is no defense field to which we are devoting more talents, skill, and money than that of missile development."

To support this contention, with which one cannot find fault, the President referred to three charts, naming missile types in three categories—"Now in Use," "Available in 1959," and "Active Research and Development." These added up to a total of forty-one missile types.

One cannot get a clear picture, however, of the missile situation without relating these types to the jobs they are designed to do.

For example, the forty-one missiles include nineteen exclusively defensive missiles—eleven air-to-air and eight surface-to-air.

The offensive missiles are in two categories—five types of air-to-surface missiles and seventeen types of surface-to-surface missiles.

Of the five air-to-surface missiles only one, the Hound Dog, is scheduled to be delivered by the Strategic Air Command—from B-47s and B-52s. The other Air Force missile listed in this category, Quail, is a decoy missile.

Seventeen types of surface-to-surface missiles were listed. Of these, two are unguided, one has a range of eight miles, two have ranges of fifteen miles. It is in this category—surface-to-surface—that the missile gap will occur, and it might be well to take a detailed look at the seventeen types.

Six types were listed as "Now in Use." They are:

Honest John: An unguided Army tactical missile with a range of fifteen nautical miles.

Corporal: A command-guided Army tactical missile with a range of seventy-five miles.

Redstone: An inertial-guided Army tactical missile with a range of 200 miles.

Regulus I: A subsonic, ship-launched, air-breathing, Navy tactical pilotless bomber with a range of 500 miles.

Matador: A subsonic, air-breathing, Air Force tactical pilotless bomber with a range of 500 miles.

Thor: An intermediate-range Air Force ballistic missile with a range of 1500 miles. Thors are deployed in England with RAF crews. None is in the hands of Air Force units.

Six types of surface-to-surface missiles are listed as "Available in 1959." They include:

Little John: An unguided Army tactical missile with an unannounced range, but designed for close support of airborne troops.

Lacrosse: A command-guided Army tactical missile with a range of eight miles.

Mace: An improved Matador, with a better guidance system and the range extended to 650 miles.

Jupiter: Inertial-guided ballistic missile, Army-designed, same range and deployment as Thor.

Snark: Subsonic, air-breathing Air Force pilotless intercontinental bomber with a range of 5,500 miles.

Atlas: Air Force intercontinental ballistic missile with a range of 5,500 miles.

Listed as in "Active Research and Development" are five types of surface-to-surface missiles. They are:

Sergeant: Inertial-guided Army tactical missile with a range of 200 miles. It will replace Corporal.

Pershing: Solid-fuel, inertial-guided, Army tactical missile. Designed to replace Redstone, but with greater range.

Polaris: Underwater-launched Navy ballistic missile with an announced range of 1,500 miles.

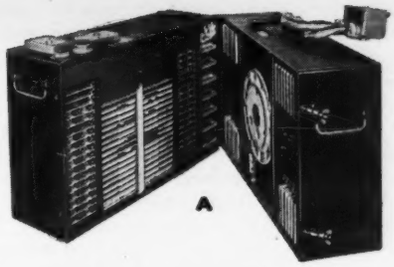
Titan: Inertial-guided Air Force intercontinental ballistic missile with a range of 5,500 miles.

Minuteman: Solid-fuel Air Force intercontinental ballistic missile with a range of 5,500 miles.

The point is that, of all the above, there are none in service today capable of reaching targets in the Soviet Union with the possible exception of Britain-based Thors. Of those "Available in 1959" only the Atlas and the Snark and Europe-based Jupiter will be able to reach the Soviet Union. Of those in "Active Research and Development," only Titan and Minuteman will be able to reach that far from US bases.

Thus, of the forty-one different categories of missiles discussed only four really affect our position vis-à-vis that of the Soviet Union in the strategic missile field, and one of these, Snark, is a subsonic air-breather.

It would appear that critics of the nation's missile program have not had all their questions answered.—END



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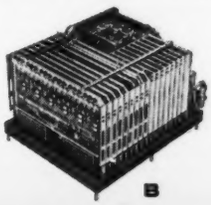

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equipment for the Federal Aviation Agency

GPL's experience and ingenuity are at work assisting the FAA Bureau of Research and Development in the creation of a modern data processing central, the heart of tomorrow's air traffic control system. The central will receive up to 400 aircraft flight plans hourly, "remember" 1,000 such plans simultaneously and transmit 200 plans and 800 updates hourly to adjacent centers. Automatic processing and unique displays of such data will make significant contributions to the efficient control of aircraft in en-route, transition and terminal areas.

The FAA data processing central is just one of a number of airborne and ground-based programs reflecting GPL's capabilities in the data handling field. These programs are supported by GPL's proven ability to understand the customer's problem and capacity to anticipate future requirements. The GPL organization is "systems oriented," offers complete capabilities ranging from research, engineering and manufacturing to customer service.

Why not put these broad capabilities to work on your problem?

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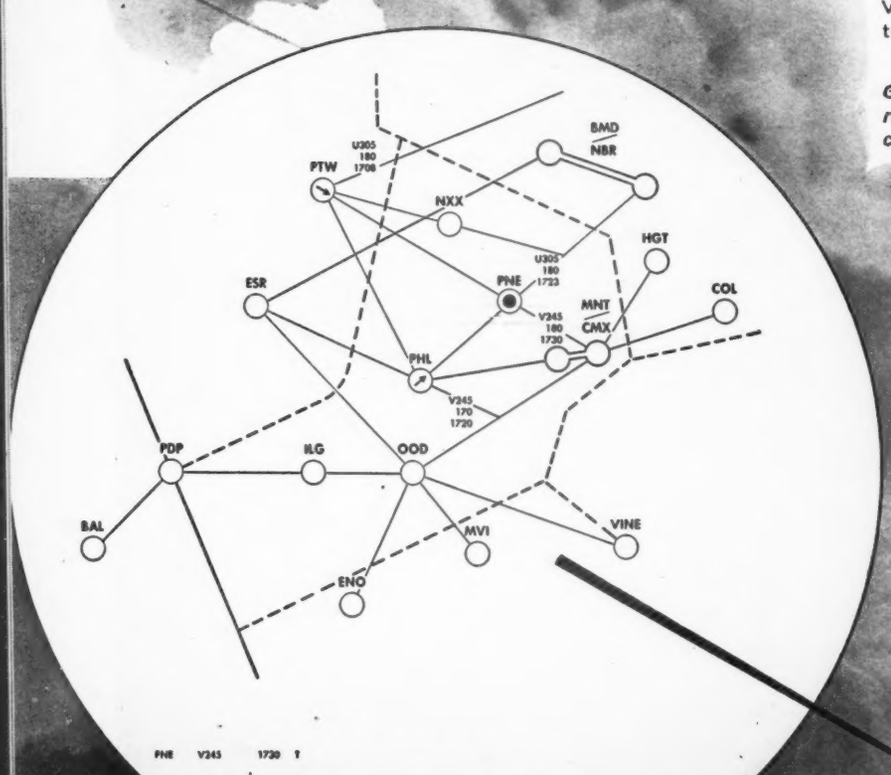

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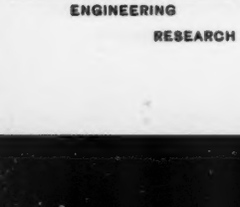

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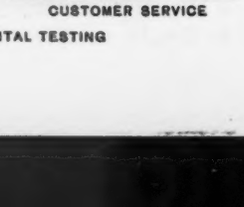

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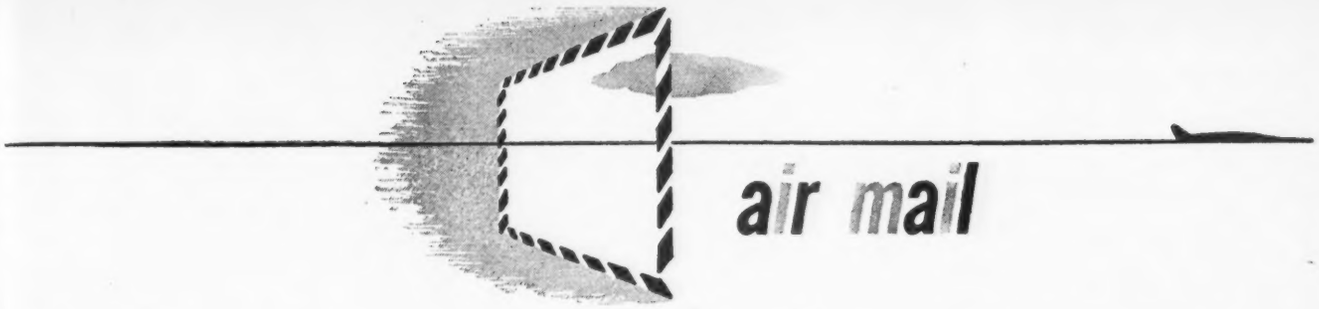

A Serious Problem

Gentlemen: I have just read in your March issue the splendid article on Air Force family housing. This is a subject in which I have been deeply interested for the past several years. We have in the Air Force made a start toward the solution of this problem. One has only to visit our bases in the United States, its territories and possessions, as well as overseas, to be impressed with the fact. However, it is only a start. The author of the article, I am certain, was convinced on this score by his own observations.

It is truly heartbreaking to visit our installations which have the finest weapons, aircraft, and facilities which money can buy, and then on the other hand view some of the housing conditions under which our highly trained personnel and their families have to live.

It is with a sense of shame and embarrassment that I have at times visited some of these deplorably inadequate houses. I have seen the embarrassment written on the faces of Air Force wives, both here and overseas, when I have entered to inspect the places in which they and their children have been forced to live. Not so long ago I discussed this problem with one of the leading B-52 pilots of the Strategic Air Command. During the discussion he made a very pertinent observation which I am sure is not untypical. "You know," he said, "I am really dedicated to SAC, as is everyone else in the Command. But the big question is how long can I expect the same dedication from my wife and my children. They have eyes. They have seen the homes of others outside the service, the kind of homes which they know I could afford if I were a civilian."

This is not only a personnel problem, it is definitely an operational problem, as your article points out. I doubt whether many people realize this. Without adequate on-base housing in sufficient amounts it could be that the old saw might apply—"For want of a nail a shoe was lost, for want of a shoe a horse was lost," etc.

I hope your article is not only widely read within the Air Force Association membership, but without, and its warning heeded. You have done a distinct service in publishing it, and I hope the problem will be met and solved by bold and determined action.

George S. Robinson
Deputy Special Assistant
for Installations
Office, Secretary of the Air Force
Washington, D. C.

Sonic Boom Education Program

Gentlemen: In the January issue of AIR FORCE/SPACE DIGEST there appeared an excellent article entitled "Learning to Live with the Sonic Boom."

At the present time, Kelly Air Force Base, as well as other USAF installations flying faster-than-sound aircraft, has quite a problem regarding complaints from citizens about sonic booms.

In order to help curtail the complaints and educate the public in the area surrounding Kelly, we would like very much to reproduce the article from your magazine and send it out to those registering a sonic boom complaint.

We note on your masthead that all material in AIR FORCE/SPACE DIGEST is copyrighted. If it is consistent with your policy, we shall greatly appreciate your permission to reproduce the article for further dissemination to the interested public in this area.

If permission is granted, we anticipate further requests from some of the papers in this area to run excerpts from the article in explaining the sonic-boom problem to their readers. What is your policy regarding the reprinting of portions of articles in your magazine?

Irvin K. Weinman
Chief, Information Services
Kelly AFB, Tex.

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The Air Force, as part of its sonic-boom information program, is distributing 100,000 copies of a reprint of Mr. Witze's article. Supporting this program are the following manufacturers: Convair, a Division of General Dynamics Corp.; General Electric Co., Aircraft Gas Turbine Division; Lockheed Aircraft Corp.; McDonnell Aircraft Corp.; North American Aviation, Inc., Republic Aviation Corp.; and United Aircraft Corp.

As a matter of interest, the following statement by Maj. Gen. Arno H. Luehman, Director, Office of Information Services, Department of the Air Force, is included as part of the reprint:

"The United States Air Force through half a century of leadership in the progress and development of airpower has become a force for peace never exceeded in the history of mankind. To maintain a high state of combat readiness in our modern high-performance jet aircraft requires that we operate them at speeds faster than sound. Such operations produce a phenomenon commonly known as a sonic boom.

"The Air Force is vitally concerned with the problem of the sonic boom and is taking all feasible measures to decrease unnecessary noise. The extensive testing and training required to prepare men and machines for combat cannot always be conducted over unpopulated regions. Supersonic jet interceptors must fly over all parts of the country to ensure that we have adequate air defense. To curtail such flights would adversely affect the capability of the Air Force to perform its mission.

"In order to provide for the future security of our nation, the development of ever more powerful jet and rocket engines will be necessary. These engines and the higher-performance aircraft they will power will intensify the problem. The Air Force will do everything in its power to reduce the impact of this noise problem. The public, on the other hand, should realize that the sonic boom is inevitable, and understand this phenomenon as the new Sound of Security."—THE EDITORS

(Continued on page 12)

CAPABILITIES FOR DEFENSE

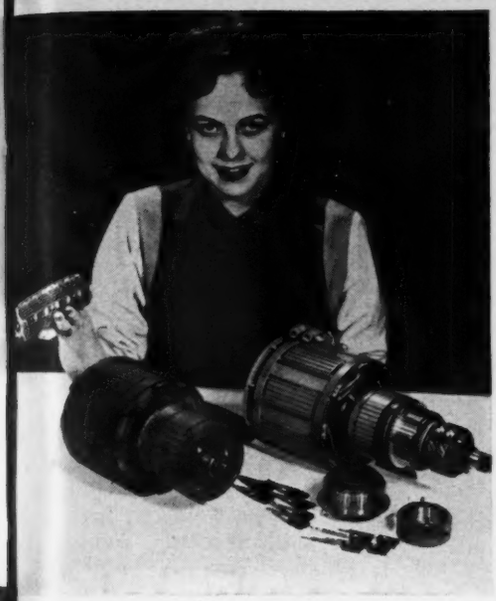
Westinghouse electrical systems, using first brushless generator, proved in thousands of flight hours

NOW IN FULL-SCALE PRODUCTION. The world's first aircraft brushless generators have a key role in advanced electrical systems provided by Westinghouse for today's military and commercial aircraft. The 40 kva units above are standard in Boeing 707 jetliners. First introduced in 1954 by Westinghouse Aircraft Equipment Dept., Lima, Ohio, these dependable generators have performed thousands of flight hours on the Boeing 707 and the Air Force B-58.

LEADER IN AIRCRAFT ELECTRICAL SYSTEMS. Westinghouse has been producing aircraft electrical systems since World War I—has built more a-c electrical systems for aircraft since World War II than any other company. Shown is the brushless air-cooled generator with control apparatus.

NAVY—The North American A3-J, completing flight tests preparatory to joining the fleet, uses the Westinghouse electrical system, including oil-cooled brushless generators.

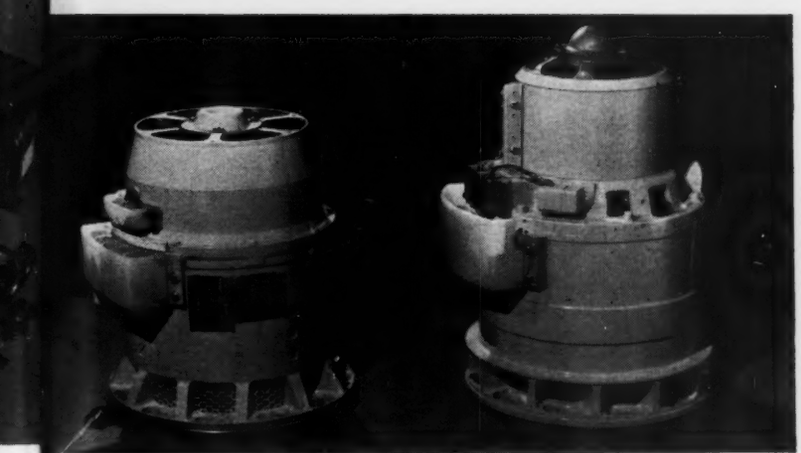
AIR FORCE—The Convair B-58 Hustler employs the Westinghouse electric power system, including oil-cooled 40 kva brushless generators.



LONGER SERVICE LIFE and greater reliability result from the elimination of commutators, carbon brushes and collector rings, shown at right. A single internal rectifier bundle, held by girl, replaces them. High-temperature silicon diodes, produced by Westinghouse research in semiconductors, make this possible.

OIL-COOLED GENERATOR for Convair B-58 Hustler achieves major breakthrough of temperature barrier in electrical generator design—is cooled by MIL-L-7808 oil, having inlet temperature of 300° F. Usual generator troubles are eliminated—no brushes, commutating or slip-ring parts to wear, Results: greater economy, less frequent overhaul.

AUTOMATIC FUNCTION SIMULATOR, one of the newer testing techniques used by Westinghouse, assures more reliable protective devices for electrical systems. This machine subjects protective control panel to as many situations as it will encounter in flight operations.



BRUSHLESS VERSUS BRUSH-TYPE GENERATOR. Both generators are 40 kva. The brushless generator on the left above uses less space and weighs less. Longer life is assured—air-cooled brushless generators are guaranteed for 3,000 flight hours, bearings up to 1,500 hours. Brushless generators with even greater life are under test at Westinghouse.

ROBOT CIRCUIT TESTER uses punched tape to check circuitry of control equipment with 100% accuracy, 60 times faster than previous techniques. Westinghouse automatic circuit-testing facilities speed production, eliminate chance of human error, improve product reliability.

COMMERCIAL—The Boeing 707 uses Westinghouse electrical system, including air-cooled brushless generators—proved in thousands of flight hours.

Westinghouse

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AVIATION GAS TURBINE DIVISION
ELECTRONICS DIVISION
AIRCRAFT EQUIPMENT DEPARTMENT
ORDNANCE DEPARTMENT

YOU CAN BE SURE... IF IT'S Westinghouse

AAS Space Flight Award

Gentlemen: I noticed in your February 1959 issue that on page 89 in your picture caption you stated the award being presented is the AAAS Space Flight Award. I should like to point out that the award is actually the AAS (American Astronautical Society) award rather than an AAAS award.

The American Astronautical Society has been giving this award for four years, having awarded it in 1955 to Dr. Oberth, in 1956 to Cdr. George Hoover, and in 1957 to Dr. Wernher Von Braun. We would appreciate a correction of your caption.

George R. Arthur, Pres.
American Astronautical Society
New York, N. Y.

● *We sounded our "A" once too often.*—THE EDITORS

More on the DC-5

Gentlemen: With reference to the letter titled "The Elusive DC-5" in your December '58 issue, I would like to clarify at least some of the mystery which appears to surround these aircraft.

Prior to the outbreak of war the DC-5s were in regular scheduled airline operation for KNILM, the Dutch East Indies subsidiary of KLM, between Batavia (now called Djakarta), and Sydney, Australia.

When the islands were overrun by the Japanese, three of the aircraft reached Australia carrying refugees and were, for a time, retained by the elements of the Dutch Air Force in Australia. However, if my memory serves me correctly, one was wrecked in a forced landing in Central Australia, one was destroyed in an air raid, and the third of which I am positive was taken over by Australian National Airways, under Australian civilian registration and used on a contract operation between Brisbane, New Guinea, Morotai, and other points in that area, for the United States Army Service of Supply until the cessation of hostilities, when it was placed in commercial service on the Melbourne-Hobart-Launceston route.

This aircraft remained in service with ANA until the gazetting of more stringent regulations by the Department of Civil Aviation regarding single-engined performance caused its withdrawal, along with the DC-2, from commercial operations, whereupon, it was parked in the "graveyard" at Melbourne airport for several months.

Finally, the aircraft was purchased by a charter operator, and the last I heard it was engaged in an inter-island operation back in Indonesia in the very late forties.

Incidentally, there is still one DC-2 operating out of Bankstown Airport, Sydney, on local joy rides for Marshall Airways. This company also purchased a Douglas Dolphin, brought to Australia by the Archbold Expedition back in the thirties, from the Royal Australian Air Force who had taken it over and operated it throughout the war. However, this amphibian did not go into commercial use but was scrapped at Kingsford Smith Airport, Sydney.

Frank G. Murphy
Tainan, Taiwan

Another on the TU-104A

Gentlemen: May I join the hassle in "Air Mail" on page 9 of your February issue?

The TU-104A which took me from Paris to Prague to Moscow was landed calmly enough by the pilot of the OK (Czech) Airline on ice-covered snow, at twenty degrees below, at midnight.

But what impressed me most about the TU-104A was the fact that I counted twenty of them lined up at the Moscow airport when I flew out on December 9, this time in an IL-14, to Helsinki. And then a few hours later the Pan-Am pilot, on the Boeing 707, Paris to New York, told me his company had only four in operation and a fifth about ready to go into service. I was painfully aware that the Russians had been flying the TU-104 in passenger service for three years!

John H. Caldwell, Mng. Ed.
Sales Management Magazine
New York, N. Y.

No Leak Here

Gentlemen: I noticed an advertisement on page 94 of the SPACE DIGEST section of January 1959, placed, apparently, by Martin.

As an ex-intelligence and security officer while on active duty with the Air Force, as an active Reserve officer, and as a private citizen interested in the security of the United States, I was quite surprised to see the excellent aerial photograph of, to quote the advertisement, ". . . one of our most valuable national resources." It seems to me that allowing such a photograph to be published, even in such a magazine as AIR FORCE/SPACE DIGEST, is a most flagrant violation of the basic security principles of our nation. I cannot conceive of such a photograph being allowed to be seen in print of a similar plant in Russia, or any other nation for that matter.

The text accompanying the photograph is an additional source of concern to me, since it points out (1) that it is Martin's Denver facility, thus identifying it specifically; (2) that it is, in effect, the home of the Titan; (3) that it is the "country's most advanced and fully integrated big-missile development center;" (4) that it is the design, construction, and testing facility of the complete Titan; (5) that the entire facility is located within a 7,000-acre complex; and (6) that it is considered by top military and scientific experts as "one of our most valuable national resources."

I do not see any justification for allowing such photographs or data to be published, especially since this data would be of interest to foreign agents and is not necessary information to be disseminated to the public. It seems to me that all publications and releases to these publications could and should be better screened to prevent such apparent breaches of security as this.

William L. Page
Abilene, Tex.

● *The copy of the Martin advertisement was deemed no breach of security by the Department of Defense. As any industry advertising director or agency account executive will tell you, the Pentagon is quite touchy about security in connection with advertising and it is quite unlikely that any information unknown to the Soviets might leak out thereby. Rest easy. If the plant is bombed it won't be on the basis of the kind of intelligence Reader Page is worried about.*—THE EDITORS

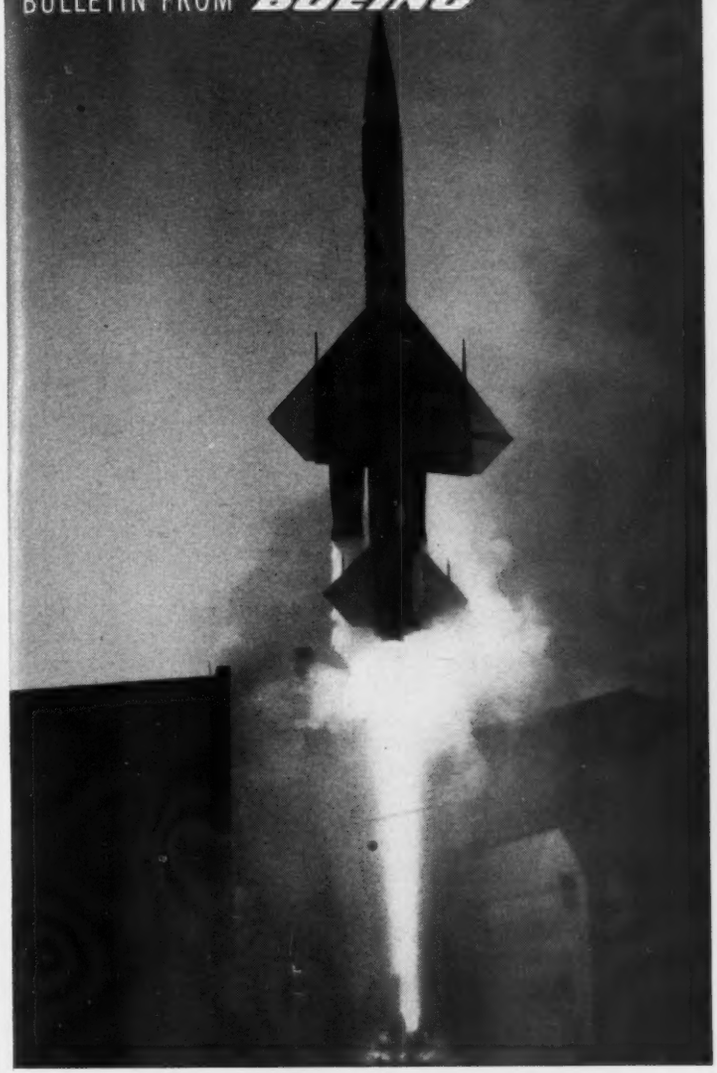
Nostalgia

Gentlemen: Your article "Bombers Against Battleships," by Samuel Taylor Moore, which appeared in the February issue of AIR FORCE/SPACE DIGEST, brought vivid memories of almost thirty-six years ago. This is due to the fact that I served with the 1st Provisional Air Brigade under General Mitchell during the 1921 bombing maneuvers, dropping a one-ton bomb on the *Ostfriesland*, and having led the formation of Martin bombers from the "airdrome" on Cape Hatteras that sank the *Virginia* in 1923.

During retirement it is interesting to observe the rapid advancements made by those we must depend on to carry on.

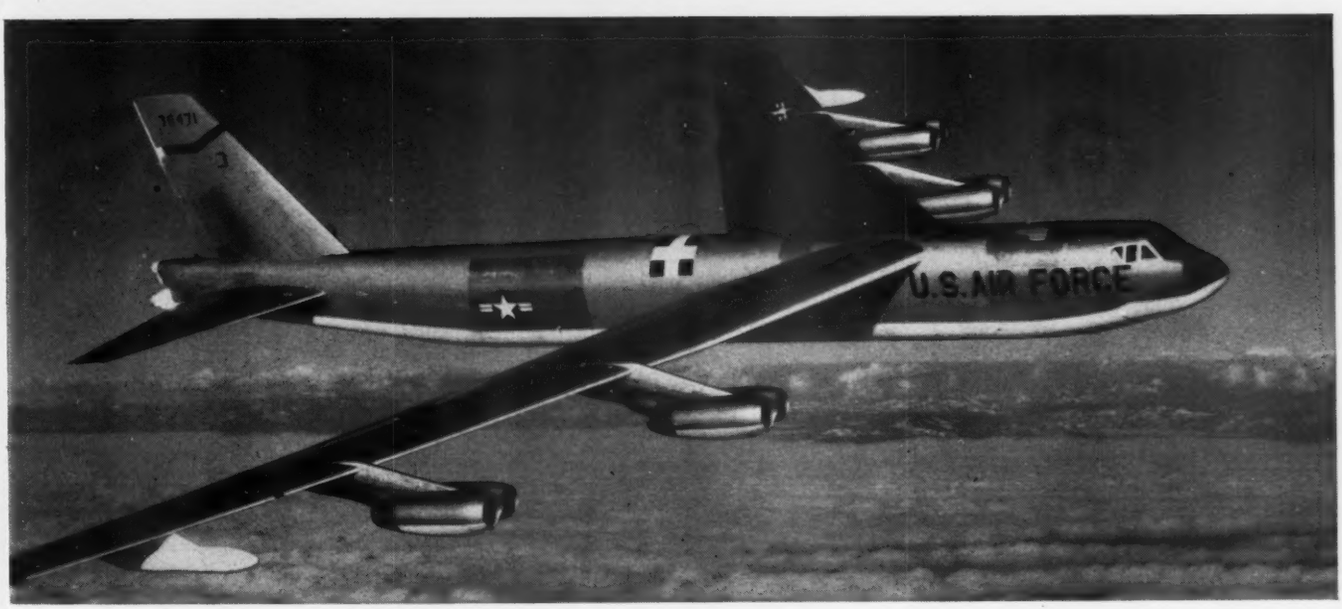
Col. H. G. Crocker, Ret.
Saratoga, Calif.

BULLETIN FROM **BOEING**



SUPERSONIC DEFENDER. Boeing BOMARC, the Air Force's longest-range defense missile, can seek out and intercept single or multiple targets long before they reach U.S. borders. One base, armed with a squadron of BOMARCS ready for instant action, can provide interceptor cover over thousands of square miles. Bases are now nearing completion. BOMARC can be developed to cope with intercontinental ballistic missiles.

MAN IN SPACE. Space-age projects at Boeing include research to develop protective environments and efficient controls for crews of advanced aircraft and space vehicles. Boeing is also at work on orbital systems, a boost-glide vehicle, and Minuteman, a solid-propellant intercontinental ballistic missile under development.



MISSILE BOMBER. Boeing B-52G, now in operation with the Strategic Air Command, is world's longest-range jet, and U.S. Air Force's most versatile long-range weapon system. B-52G carries supersonic air-to-ground missiles for in-flight launching hundreds of miles from target areas, in addition to regular nuclear bomb load. B-52G can strike several targets thousands of miles apart on a single retaliatory defense mission.

BOEING

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What's New With ★ RED AIRPOWER

Here's a summary of the latest available information on Soviet air intelligence. Because of the nature of this material, we are not able to disclose our sources, nor document the information beyond assurance that the sources are trustworthy.

A recent study of East Germany's growing aircraft industry shows how closely satellite aviation manufacture is geared to Russia's own. Russian advisers sit in the East German Bureau of Aeronautics. Mostly technical persons, they integrate German and Soviet production techniques, with information flowing both ways.

The East Germans are set to produce three engines of Russian design—a turbojet, a turboprop, and a conventional piston type. In effect, the Soviets have gained additional production facilities in East Germany.

Aeroflot, the Soviet airline (*see page 135*), continues to stretch its wings. Latest route to be opened is to Pyongyang, North Korea. One round trip per week will be flown, using TU-104s, from Moscow.

This brings Aeroflot closer to Tokyo—and a through route from Copenhagen and Brussels, where they now have landing rights, to the Far East that would cut hours off the mideast route flown by other airlines.

• • •

According to a report in the Soviet Air Force newspaper, poor airfield conditions decided which Red aviators got to stage the grisly attack on a USAF C-130 over Soviet Armenia last September. The fighters initially assigned to the mission, it was said, reported, "There is a dust storm on the field. It is impossible to take off."

A squadron stationed at a second field got the job—and its pilots were tape recorded for posterity. The news report did not specifically identify the "enemy" that came under attack.

• • •

Some details of the Russian supersonic bomber, called Bounder by the NATO powers, have become available. It is the closest the Russians have been able to come to the Convair B-58 Hustler, although it has neither the speed nor the altitude capability of the latter.

Bounder is a six-engine affair, with two engines buried in the wing roots and four suspended outboard beneath the delta wing. Actually not a true delta, the Bounder has an empennage with horizontal as well as vertical stabilizers. This suggests that it is a Sukhoi design.

Although it presumably can carry bombs, its principal weapon is understood to be the air-to-air missile, guided by infrared seeking equipment mounted in the nose like the US Sidewinder. This suggests that Bounder is designed for both fighter and bomber missions.

• • •

Both the Russian Air Force and Navy have been concentrating heavily in recent years on electronic countermeasures work. US and Canadian ships and planes have long known this work was going great guns among Russian fishing fleets operating in the Atlantic off North America. Red fishing vessels in many parts of the world are heavy laden both with radar and radar countermeasures equipment. Many missions flown by Red planes today are concerned with proving and checking ECM gear, according to reports from within the Soviet Union.

• • •

Latest indications are that the Russians are going to make the MIG-21 Faceplate ***(see page 54)*** **their principal fighter for some time. The airplane is well into series production, and the MIG-23, which the Russians talked about in 1957, hasn't developed as expected. The MIG-19, of which a hundred or so were built, is being turned over to satellite and friendly powers, including China and Iraq.**

The Reds have been faced with the problem of bringing the performance of their interceptors up to that of the US B-52 and B-58 bombers. Even in the MIG-21 they do not have a fighter that can really do a good intercept mission against the two newer American bombers, although it might be tougher on the older B-47.

• • •

A check of top Russian aircraft designers reveals that only one of them, Tupolev, is not a member of the Communist Party. Ilyushin joined early in the game—back in 1918. Lavochkin didn't join until 1952, long after he had made his major contribution in the form of the LA-series of fighters used during World War II.

Actually, Tupolev was closely allied with the Communist Party in Russia in the early days when he was deputy director, Main Administration of the Aircraft Industry, USSR People's Commissariat of Heavy Industry.

However, he never has felt the same toward the Communist Party since it accused him in 1936, following a visit to the US and Germany, of divulging state secrets. In 1938 he was arrested and put into a police-administered design bureau. He was not released until 1943, when Russia found it couldn't afford the luxury of keeping its geniuses in jail.

• • •

The Russians say they have found a new method of radio communications: use of meteor trails for wave reflection. This would make it possible to transmit messages farther, and directly upon a given receiving point.

Actually, this technique has been demonstrated in the US by General Electric and other companies. Meteor traffic is so thick some sixty miles above the earth's surface that G.E., which has been sending such messages for some time, usually takes only a couple of minutes to get a message through from Ithaca, N. Y., to Washington, D. C.

The Russians, who evidently haven't done as much with the idea, say they are going to experiment with rockets that can be sent aloft and exploded at the proper altitude to create an ionized layer similar to a meteor trail. They then would use this to bounce messages off at the proper angle to get an intercept thousands of miles away.

Radio communications are particularly important to the Russians because they do not as yet have the extensive telephone communications system found in the West.

• • •

The new Soviet research center being built in Novosibirsk, mentioned before in this column, will include advanced facilities for aerodynamic, missile, and flight propulsion research. The Russians have indicated they also will do much advanced nuclear work at this research center, possibly including nuclear-powered flight research.

• • •

Russian experience with foreign airlines flying into Moscow has convinced them that they will have to increase vastly the number of airways communications channels and the number of frequencies available to their aircraft and control towers.—END

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Aerospace Panorama

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SEPTEMBER 3-4-5-6

Miami Beach Auditorium, left, where Industry Briefings and Reserve Seminar will be held. New Exhibition Hall, right, site of AFA's Aerospace Panorama.

Seville Hotel, where AFA Business Sessions will be held, is in foreground. Fontainebleau and Eden Roc Hotels are shown in the extreme upper left corner.

The Program

• WEDNESDAY—SEPTEMBER 2:

6:00 PM AFA Directors Dinner Meeting*

8:00 PM AFA Leaders Meeting*

• THURSDAY—SEPTEMBER 3:

9:00 AM Reserve Forces Seminar

12:00 N AFA Honors Luncheon

3:00 PM 1st AFA Business Session

7:00 PM Panorama Preview Reception

• FRIDAY—SEPTEMBER 4:

9:00 AM 2nd AFA Business Session

9:30 AM 1st Industry Briefing**

11:30 AM Industry Buffet Luncheon**

2:00 PM 3rd AFA Business Session

2:30 PM 2nd Industry Briefing**

7:30 PM Annual Banquet

• SATURDAY—SEPTEMBER 5:

9:00 AM Symposium

12:30 PM Aerospace Luncheon

7:00 PM Air Force Reunion & Seafood Safari

• SUNDAY—SEPTEMBER 6:

1:00 PM Panorama Open to Public

* Closed Events.

** Not included in registration fee.

REGISTRATION FEE—$25 Per Person

LISTED to the left is the program for the Air Force Association's 1959 National Convention and Aerospace Panorama, to be held in Miami Beach, Florida, September 3-6, Labor Day week-end. You will note that the schedule is quite different than for previous AFA Conventions. The Convention actually ends Saturday night, September 5, with the major social event of the Convention—the Air Force Reunion and Seafood Safari. Previously, the Convention has ended on Sunday, with a brunch. The brunch now becomes the AFA Honors Luncheon on Thursday, September 3. The Panorama will remain open on Sunday, September 6, to enable the many Labor Day visitors to view the displays. It is undetermined whether or not the Panorama will be open on Labor Day.

The 1959 program schedule is designed so that those who bring the family to the Convention can remain in Miami Beach over Labor Day; or, those who wish can fly home Sunday and spend Labor Day with the family.

Thousands of Air Force personnel trained for World War II in Miami Beach. The Air Force Reunion Saturday night will bring back many memories of those days and will make it possible to renew many of the friendships made while serving together. Why not make the trip to sunny Florida a real double-barreled, family affair—attend the AFA Convention and spend a Labor Day vacation on the beach.

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. . . But the final and most crucial moments occur in the quiet loneliness of "out there" when the missile locates, tracks and detonates. These final moments don't depend upon reliability . . . they *are* RELIABILITY.

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AIRPOWER in the news

Claude Witze
SENIOR EDITOR

SAC Still Is the Deterrent

WASHINGTON, D.C.

As this is written, the Ides of March are approaching along the Potomac. This year there is a minimum of anticipation of spring, the cherry blossoms, and the influx of tourists and the DAR. The town is more serious than it has been in a long time. Perhaps a sociologist could find a connection between this aura of concern and the fact that the petty crime rate has fallen off sharply. It is easier, from the editorial desk, to look the other way and try to find out why we are so serious. The answer is that the Brandenburg Tor looms bigger than the Washington Monument and that Berlin represents a menace.

At a press conference on March 5, just as Congress appeared ready to blow its stack, a reporter asked Defense Secretary Neil H. McElroy why a cutback in the ground forces is not being delayed. He pointed out that the slash was held up for the Lebanon and Quemoy affairs and wanted to know what is different about the new situation in Germany.

Here is the answer, right out of the record:

"I think I would have difficulty in doing that. . . . The rationalization that I would give you would be one that I wouldn't regard with any great respect myself."

Mr. McElroy must be credited with giving an honest answer under the circumstances, even if it did provoke some laughter. In all fairness it must be put in the record that he followed quickly with a declaration that the United States does not regard "limited war as a possibility in the NATO area."

He was backed up by his boss. The President of the United States, elected to office largely on the basis of his military reputation, later—almost a week later—became even more honest than Mr. McElroy and told the nosey newspapermen we couldn't win a ground war in Berlin if we wanted to fight it. A nuclear war, he indicated, is possible.

For some strange reason portions of both the press and Congress seem to view this attitude as something new and strange and possibly perilous. It is not. This reporter toured the NATO front from Norway to Turkey in 1956, 1957, and 1958, winding up each year with the current briefing at SHAPE headquarters outside Paris. Doing this, out of Washington, has involved something like 30,000 miles of travel and at least one full working day of lectures from Gen. Lauris Norstad, SACEUR.

General Norstad, a successor of General Eisenhower in that headquarters, always has recognized—and so declared himself in 1956, 1957, and 1958—that the Strategic Air Command is *the* deterrent. He has maintained steadily that limited war in Europe is highly improbable so long as NATO keeps its shield up and the SAC sword is reasonably alert. At this late date it is almost amazing that there remain American citizens who can look at the map of Western Europe without visualizing the role to be played by airpower if it must be defended.

In the August 1958 issue of AIR FORCE we wrote in these columns that General Norstad "does not anticipate any technical changes or weapon-system advances by the enemy that would make SAC ineffective in the next five to ten years. Asked whether he is more concerned about Russian defensive capability than he was a year ago, the SHAPE commander replied: "Not substantially."

The only logical conclusion an observer can draw in this city as the Miltown sales increase is that there is insufficient understanding, at this late date, of the SAC mission and NATO's dependence upon it. If an attempt is made to forcibly shut the ground and air doors to East Germany, it is hard to see how war can be avoided.

Mr. McElroy has proclaimed that the Western powers are working out a "variety of combinations of air and ground access." After all, it will not take a very large ground force to test the East German frontier. If shooting starts, the SAC deterrent has failed to deter and it will be turned to retaliatory purposes. Ground soldiers will be lucky it they can stay out of the way.

It is in many respects unfortunate that this conversation, about the kind of threat expected if there is no profit in negotiations about Berlin, takes place while the fiscal 1960 budget is under consideration. The juxtaposition of the topics on the floor of Congress has used up a good deal of space in the *Record* and may not have contributed a thing to today's crying needs in the Defense Department.

There is proof of this in the more-or-less clandestine reports coming from White House meetings of congressional leaders. According to James Reston, of the New York *Times*, the President must put his confidence in airpower because he does not believe it inconsistent to cut the power of ground forces at this time.

At the same time, he showed no inclination to take any action about the force in being that is commanded by Gen. Thomas D. White, USAF Chief of Staff. The general, on invitation from the Senate Preparedness Subcommittee, has lamented the failure of the fiscal 1960 budget to provide faster replacement of B-47s with the supersonic B-58. He also is disappointed that nothing is being done about the nuclear propulsion airframe, and he feels there should be more Bomarc coverage for home defense. He has found deficiencies in the construction program and the funding for operations and maintenance. If the administration and the NATO commander are reliant on airpower for this and future crises in Europe, more heed should be paid to General White's plea.

President Eisenhower, according to *Times*man Reston, came back time and again at a conference with congressional leaders "to the thesis that the Russians were working on a strategy of spending the United States into bankruptcy.

"Whenever it was suggested," Reston wrote, "that the nation should step up its missile program or, particularly, that it increase its conventional armed forces to be able to deal with any military outbreak around Berlin without

(Continued on following page)

Wide World Photos, Inc.

Gen. Thomas D. White, USAF Chief of Staff, meets Senator Lyndon Johnson (D-Tex.) outside closed hearing at which status of armed forces was considered in face of crisis.

using atomic weapons, he returned to the thesis about not getting caught in the Communist strategy of trying to spend us broke."

If the President has explained how this is compatible with his determination to stand firm in such crises as this, it has not been made clear to the public.

Communications, Again

Since the unfortunate confinement of Secretary of State Dulles to the hospital, the President's press conferences have become more frequent. Mr. Eisenhower now is the lone Administration spokesman on all kinds of international affairs, and the crisis in Berlin has added a great deal to the burden. At his most recent meeting with reporters he made it clear we are not going to fight a ground war in Europe. This naturally led to the question causing all the stir in Congress: Does he see anything in the scene that would or could cause an increase in the defense budget? The President said:

"Well, this is a subject, of course, that is under discussion all the time. What you do and what must be done is a production of a defensive plan by all of the, the nearest you can get of a consensus on this vital subject by those people who are best informed and who believe that we must negotiate always in this business of seeking a just peace from a position of strength.

"Now, you make out a plan and you follow that plan, and you do not want, and, as a matter of fact, it would be ruinous to be pushed off this plan time and again by something suddenly described as a crisis."

He then spoke of the Communist effort to promote revolution and delivered some more paragraphs on how we should meet the continuing tensions:

"Now, they focus these difficulties, or they find these tensions, or they find some way where they can make it very difficult for the free world to carry on its planned program of strengthening the associations among the several nations that are free and trying to remain free, and to keep our defenses strong and adequate, as we seek this just peace.

"Now, every time one of these incidents, or one of these, you might say, these foci of tension occur, we have something that's called a crisis, and everybody has a new answer, whether it is Sputniks, or it's Quemoy or it's Korea, or whatever it is, what we have to do is to stand steady, as I see it, to be alert, to watch what we are doing, and to make certain that we know how and where we would have to produce action, if action became necessary."

The President went on, but never seemed to disclose what kind of war he is prepared for. Even the Washington *Evening Star*, normally a strong supporter, accused him of speaking "high in the fog index." In contrast, it has been pointed out that Mr. Dulles does use simple sentences and they can be important as the cold war gets warmer. Dr. Henry A. Kissinger says the Berlin affair is a threat to the Western alliance, and there is doubt about both our willingness to take a risk and our ability to understand a threat when we see one.

It must be said for the Administration that it recognizes our reliance on airpower in this particular situation even if it is not doing what it should to maintain the force in being. At the same time there is no sign that the message is getting across, even with a famous military man in the White House. Certainly he did not help the situation very much with his discourse quoted above.

As we go to press, General White, who is an articulate gentleman in more than one language, has just been subjected to a new round of questioning by the Senate Preparedness Subcommittee. Presumably he repeated the shortcomings he fears from the fiscal 1960 budget plan. Chairman Lyndon Johnson, Texas Democrat and party boss, said after hearing General White that he wants to make sure USAF keeps its "paralyzing punch," not only for Berlin but any other crisis that arises in the future.

That's fine, but Gen. Maxwell D. Taylor, Army Chief of Staff, also was heard with more astounding results. Of all people, it was Senator Leverett Saltonstall, the Massachusetts Republican, who came out of General Taylor's seminar with the announcement that he now has some reservations about the Eisenhower defense budget. This was only about seventy-two hours after he, Saltonstall, was defending the program on the Senate floor. And he still seems to have missed the point about his Administration's decision, at least in this instance, to avoid a war on the ground, a decision fully in keeping with long-established NATO policy.

Vaudeville Is Dead

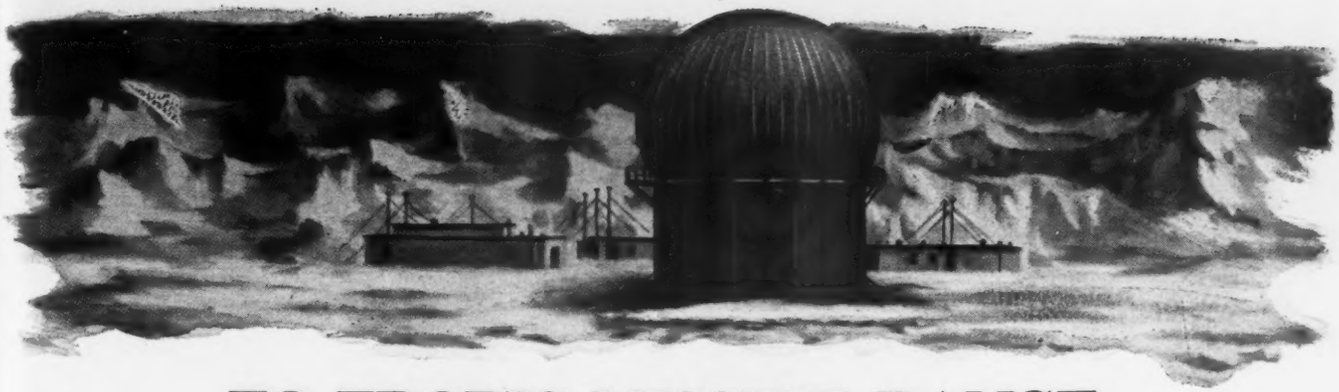
During the past month we paid a visit to the first hearings conducted by the new House Committee on Science and Astronautics. The name of last year's group, you may remember, was the Select Committee on Astronautics and Space Exploration. With the change in title and the establishment of a permanent group there also was a shift in the chairmanship. The competent John W. McCormack of Massachusetts has stepped aside and turned his job over to Overton Brooks of Louisiana.

Obviously, the name of the new committee widens the scope of its concern to cover hybrid corn, how to get the salt out of sea water, and everything else in the scientific field from the Kinsey Report to Project Mercury. Presumably under this license and because propulsion is involved, the committee has been quizzing some choice Defense Department witnesses about the Army's Nike-Zeus. We sat in on the session the day that Chief of Staff Nathan F. Twining and Defense Secretary Neil H. McElroy were on the stand. This column can stand as an unsolicited tribute to the enduring patience of two devoted servants from the Pentagon.

In the first place, the hearing was not centered in any

(Continued on page 23)

ARCTIC DEWLINE



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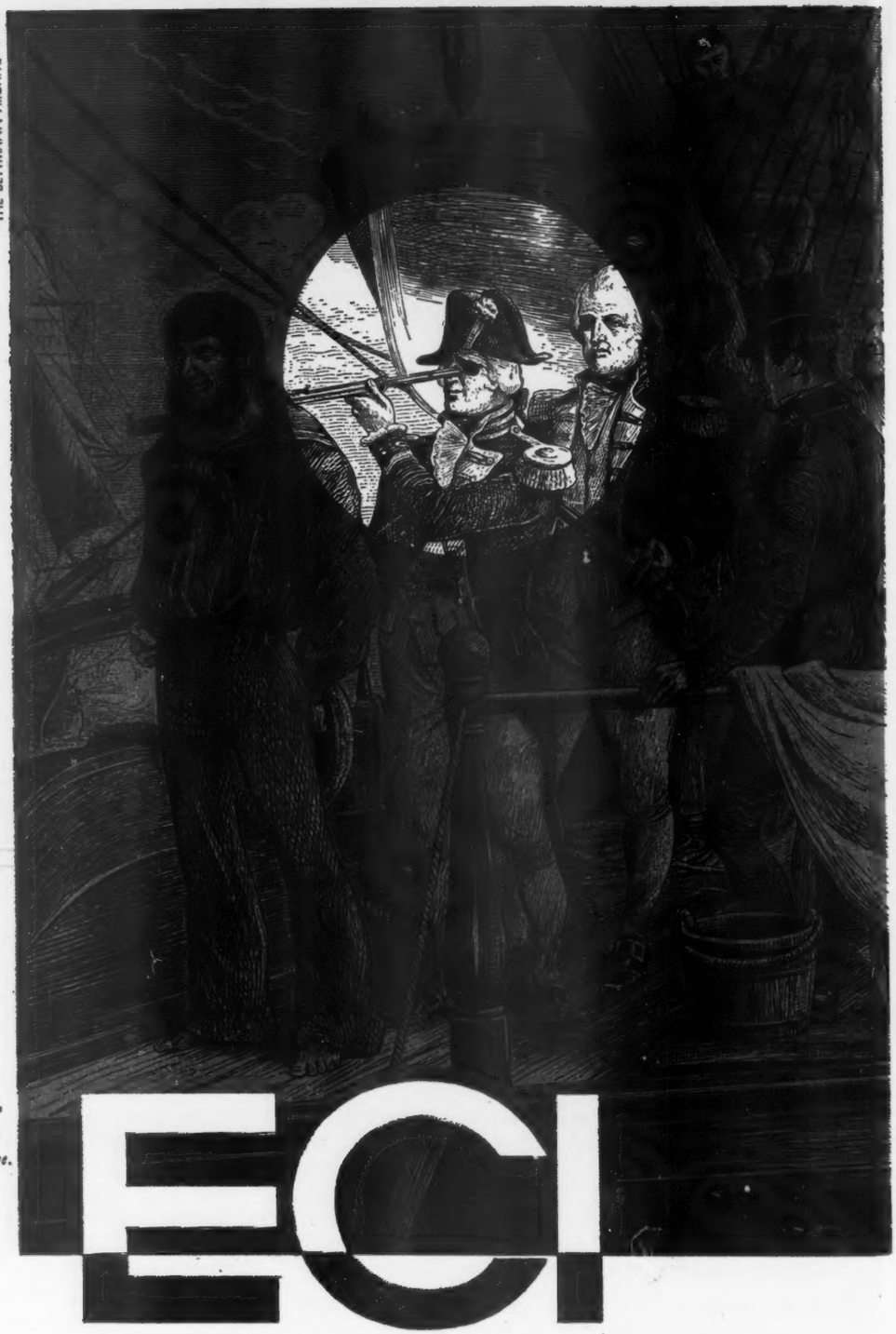

THE BETTMANN ARCHIVE

RECALL AT COPENHAGEN

During the battle of Copenhagen, April 2, 1801, Sir Hyde Parker, Commander-in-Chief of the English fleet, whose ship, the London, *was stationed some distance from the fight, peering with mounting anxiety into the flashing, thundering clouds of gun-smoke, and believing that the battle was going badly for the English, hoisted the RECALL signal to break off the action.*

Rear-Admiral Lord Nelson, on the badly-damaged Elephant, *in the thick of the action, felt sure of the victory that ultimately was achieved.*

In great indignation at the order, Nelson turned to his flag captain and said, "Why to leave off the action! Now damn me if I do! You know, Foley, I have only one eye. I have a right to be blind sometimes."

He raised his long-glass to his blind eye, smiled at the bunting fluttering over the London, *and announced, "I really do not see the signal."*

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respect on its announced topic. The questioning ranged all over the lot. Our notes reveal discussions about the accuracy of reporting by the Alsop brothers, the deterrent power of SAC, the crisis in Berlin, hydrographic exploration, the Army's old cavalry, the reliability of US intelligence services, public relations policies, the multiplicity of agencies in the space program, the requirement for an airborne alert by SAC, the lack of adequate basic research, and the new position of William Holaday in the Pentagon.

It was pretty obvious that somebody had given the committee a steer indicating that the Army has a solution for the Russian missile menace. Further, it is alleged in some circles that the Nike-Zeus project is so far advanced that it is time to appropriate money for work on a production line. This funding has been denied by Mr. McElroy. Not, he says, to save $300 million in fiscal 1960, but because he has sound scientific advice on the subject which indicates it is far too early to freeze the design. He indicated the major part of the problem is not the missile itself, but the accompanying radar, which must be smart enough to discriminate between a hot warhead and a decoy.

The witnesses made it clear to the committee that they still rely on SAC for deterrent power and feel that money spent to maintain this power will go for a more promising purpose than money put into production facilities for an uncertain form of defense.

There were moments when it seemed as if the hearing itself was about to take off—on some flight of the imagination. One example was the suggestion of a fairly dignified congressman that we devise a way to deflect an incoming ballistic missile, give it additional thrust, and put it into orbit. Another man was fairly well excited about a report in the morning paper that Mr. Brooks had discussed with the press the scheduled firing dates for some of our space probes. He cooled off when it was disclosed to him that the dates had been published a couple of weeks earlier in *Aviation Week*, a journal that keeps abreast of such things and from which, Mr. Brooks did not deny, any congressman could have learned the facts.

The Army Speaks Out

It was refreshing to step from the House Science and Astronautics version of "What's My Line?" into another hearing room across the street in the New House Office Building. Here Mr. Chet Holifield, California Democrat, was presiding over the Military Operations Subcommittee of the Government Operations Committee of the House. The chairman, in this case, is somewhat opinionated, but he is fair and eminently sensible.

The Holifield committee's peek at management of the ballistic missile program started, as we reported here last month, with a study of USAF and the Ramo-Wooldridge arrangement. Well, we went back to listen to the case presented by Maj. Gen. John B. Medaris, Commander of the Army Ordnance Missile Command, and we were favorably impressed. Not impressed by the arguments for the arsenal concept offered by General Medaris and Army Secretary Wilber Brucker, but by their competence as witnesses, their meticulous preparation for the quizzing, and the persuasiveness of their battle line of assertions.

Mr. Brucker worked hard to justify Army's continuation of the Jupiter IRBM project after Charlie Wilson, then Secretary of Defense, tried to put it out of business. And he argued, with a gusto that you should expect from a former Governor of Michigan, that the Army has many requirements "that inherently involve space vehicles." He presented a good summary of Army's accomplishments in the space race and had the added advantage of speaking while the countdown was under way at Cape Canaveral for Pioneer IV. The bird went off, and the next morning General Medaris resumed the witness stand with a flash report on its progress toward the moon. Good show.

The Army also did not miss an opportunity to discount Air Force progress and methods in the missile area. General Medaris claimed full credit for uncovering a flaw in the North American engine that is used in both the Jupiter and Thor IRBMs. He accused both the manufacturer and USAF of resisting his demand for a "fix" and suggested that the Air Force went on with a test shot program after the Army refused to continue. He spoke up in favor of spelling out the allowable and unallowable costs in every contract, arguing that this procedure eliminates a lot of hassles with the cost inspector. He indicated a tough attitude on costs.

This kind of defense for his own system was entirely understandable, and there is no doubt he told the committee about all the things that could be expected to confirm their own ideas about how to do business. The payoff, however, came when he was asked whether he knew USAF's Col. Edward N. Hall, who happens to be prominent in the Minuteman solid-fuel ICBM project, as an officer in the Air Force Ballistic Missile Division.

General Medaris said that he knew Colonel Hall and added, "unfortunately." He later said the colonel is *persona non grata* in his office and that he preferred not to discuss the subject. So far, we have not been able to uncover the background on this conflict, and we don't feel that it matters very much. Observers at the hearing unanimously felt that the incident failed to reflect any discredit on Colonel Hall but certainly looked unseemly on the record as a comment from a General officer.

In the most recent issue of the *Air University Quarterly Review*, published at the Air University, there is a learned essay by Colonel Hall on "Industry and the Military in the United States." It argues that the military services should make sure they have competent development engineering officers. It further argues that the services should not compete with American industry.

More on the Space Effort

There is an obligation to report any and all progress made in Washington toward the simplification of the space effort. On that basis, there is nothing to report. Senator Clair Engle, recently promoted by his constituents from the lower House, made a speech in his home state of California in which he deplored the situation. But at the hearings on Capitol Hill the situation is defended. There will be more opportunities to do this with a new investigation about to be launched by Senator Stuart Symington (*see "Speaking of Space," page 117*).

George P. Sutton, the MIT aeronautical engineer, has been named Chief Scientist of the Pentagon's Advanced Research Projects Agency, and nobody seems to speculate any longer on the idea that ARPA would be permitted to pass out of the picture. At the moment, the Senate and the House Science and Astronautics Committee have approved authorization of an extra $48,354,000 to carry on work of the National Aeronautics and Space Administration.

When Senator Symington starts work on his study, preliminary to action on the NASA budget of $485,300,000 for fiscal 1960, he will be told by Secretary McElroy that the Defense Department does not believe military space projects should be assigned outside of Pentagon agencies. On the other hand, he does not care which agency does the actual work, so long as military objectives are met.—END

FLIGHT LINES

Two **reluctant white rats** rode the **35,000-foot rocket sled track** at the AF Missile Development Center's **Holloman AFB** during dedication ceremonies for the new track last month. After the **1,090-mph G-force test,** one of the rats, strapped in a position that kept it perpendicular to the heart-head line, was in **good shape.** The other, strapped on its back in a longitudinal position, recovered for an hour but then **collapsed because of "internal disturbances."** Further tests will be made, working up through **chimpanzees, small bears, and finally humans.** The test sled was boosted to top speed by an **Astrodyne Megaboom** solid-rocket motor that delivers **100,000 pounds of thrust** during its ten seconds of burning.

The **Federal Aviation Agency** has invited all pilots and aircraft owners to a **general aviation fly-in** at the National Aviation Facilities Experimental Center, **Atlantic City, N. J.,** on the week end of May 9. **Elwood Quesada, FAA** administrator, said the fly-in will give general aviation people **first-hand information on plans and programs for modernization of the nation's aviation facilities** to meet the rapidly growing needs of aircraft navigation and control.

Lockheed Corp. has sold **West Germany** ninety-six **F-104 Starfighters** and agreed to construction of 200 more by German aircraft companies, at a total cost of about $375 million. Licenses will be held by the German Defense Ministry, with major production by three companies: **Dornier Werke GmbH, Ernest Heinkel Fahrzeugbau GmbH, and Messerschmitt A.G.**

The **Air Force Photography Contest** will be conducted in **May** at base and major command level. Winning entries will be forwarded to the USAF Photo Contest at a base to be selected later. The **Eighth Interservice Photography Contest** will be held in **June** with the **Marine Corps as host.** Rules and details of the contests are in AFR 34-68, February 11, 1959.

The new **Martin P6M-2 SeaMaster** is in flight test at Middle River, Md., just outside Baltimore. The SeaMaster, a beefed-up version of earlier models, is powered by four **Pratt & Whitney J-75 turbojet engines.** Its mission is anti-submarine duty, with a planned capability to attack subs in their home ports.

The **USAF Academy Foundation** has submitted plans to **Maj. Gen. James Briggs,** Academy Superintendent, for a **40,000-seat football stadium,** designed for later expansion to 70,000 seats. The Academy team's unbeaten season of last year, with a scoreless tie against Texas Christian University in Dallas' Cotton Bowl on New Year's Day, may help in collecting the estimated **$3 million** that would be raised in a voluntary nationwide fund-raising campaign.

The **Western Technical Net,** Air Force **Military Affiliate Radio System**—the earthly MARS—celebrates **its first birthday** this month. The technical radio nets, western, central, and eastern, **broadcast educational features** for the USAF MARS program. MARS members are active and Reserve military and civilians who have amateur radio licenses.

NEWS OF PEOPLE . . . Gill Robb Wilson, editor and publisher of *Flying* and chairman of the board of trustees of the Space Education Foundation has been elected to the board of directors of the **Dalto Corp.,** makers of the Dalto Visual Flight Simulator Attachment. . . . **Col. Bernt Balchen,** USAF (Ret.), has become vice president for planning of **Resort Airlines, Inc.,** of Delaware. . . . **Dr. Nicholas E. Golovin,** who was chief scientist at the White Sands Missile Range, has been appointed director of **ARPA's new Technical Operations Division. . . . Philip B. Taylor** has been named to succeed Dudley Sharp as **Assistant Secretary of the AF for Materiel. . . . Dr. Mervin J. Kelly,** chairman of the board of Bell Telephone Laboratories, **retired on March 1** after forty-one years of scien-

(Continued on page 27)

The last of the B-36s, left, obsolescent in the jet age, was retired at Fort Worth, Tex., February 12. The city will install the ten-engine bomber at Amon Carter Field in memory of the weapon system that deterred aggression without ever firing a shot in anger. Right, at Reese AFB, Tex., a mounted B-25 was unveiled by USAF Gen. Thomas D. White.

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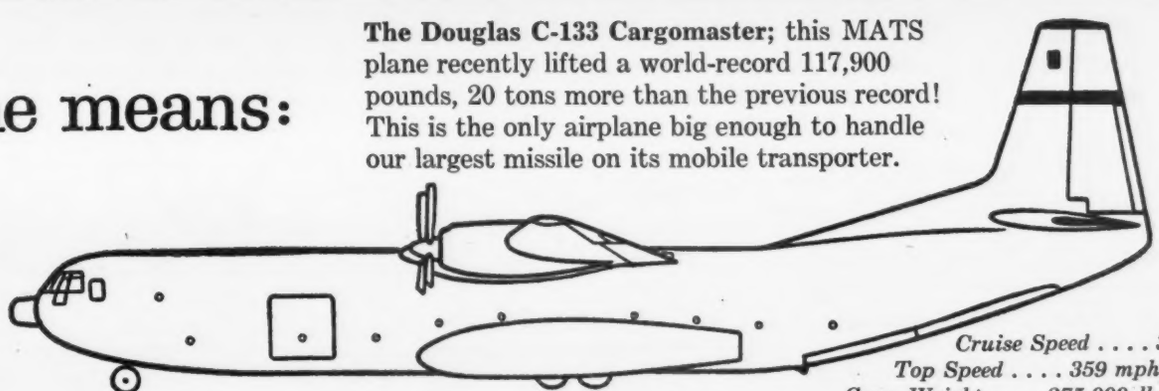
The Douglas C-133 Cargomaster; this MATS plane recently lifted a world-record 117,900 pounds, 20 tons more than the previous record! This is the only airplane big enough to handle our largest missile on its mobile transporter.



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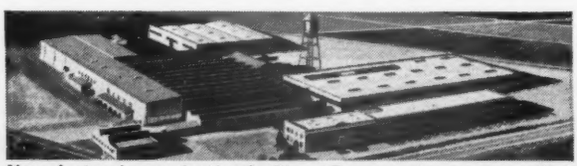
NAVY SELECTS RYAN C-W DOPPLER NAVIGATORS FOR MAJOR AIRCRAFT

Six major types of Navy aircraft will be equipped with Ryan continuous-wave Doppler navigation systems, the AN/APN-122 (V), under an initial $20-million contract awarded by the Navy to Ryan's Electronics Division. Ryan's automatic, all-weather, self-contained navigators will be installed in the Navy's Lockheed Neptunes (P2V), Martin Marlin patrol planes (P5M), carrier-based Douglas Sky Warriors (A3D), and three types of Grumman aircraft.

Developed in cooperation with the Navy, these advanced electronic systems are the lightest, simplest, most compact, and most reliable of their type. The new order, one of the largest of its kind, emphasizes Ryan's leadership in navigation and guidance systems.

With a solid backlog of this and other important contracts for RYANAV systems, the Ryan Electronics Division is growing even faster than this fastest growing industry. Personnel and facilities are being doubled, both in the new production plant at Torrance, Calif. and at the San Diego facility, where a modern new electronics research center is under construction.



New electronics production facility at Torrance (near Los Angeles).

New electronics research center at San Diego.

Ryan's rapid growth in electronics is creating new opportunities for engineers and technicians

RYAN BUILDS BETTER

Above, XQ-4 supersonic target drone starts on its mission as a high-speed missile target. Developed for USAF by Radioplane Division of Northrop Corporation, XQ-4 missile targets are currently being flown in tests at Holloman AFB, N. M.

At right, XQ-2C Ryan Firebee, newest, most advanced version of jet target drones made by Ryan for the USAF soared to an altitude of 46,000 feet when launched from its B-26 "mother plane," flew twenty-six minutes, glided to earth.

tific and administrative service with the Bell system. He will serve as consultant to **Bausch & Lomb Optical Co.** . . . **Lewis S. (Pinky) Thompson** is the new **Special Assistant to the Secretary of the Air Force for Manpower, Personnel, and Reserve Forces** (see page 146 for additional details). . . . **Dr. Howard A. Wilcox,** formerly assistant technical director of research at the Naval Ordnance Test Station, China Lake, has become **deputy director of Department of Defense Research and Engineering.** . . . **Gen. Edwin W. Rawlings,** who retired as commander of AMC in February, has been elected to the board of directors of **General Mills, Inc.,** Minneapolis, Minn., and will be **financial vice president** of the company. . . . **Louis Ridenour,** former chief scientist of **Lockheed's Missiles and Space Division,** is vice president and general manager of the company's new **Electronics and Avionics Division.**

On the Calendar:

Annual Meeting of the **Army Aviation Association of America,** Shoreham Hotel, June 5-6.

NATO **Advisory Group for Aeronautical Research and Development,** unclassified meeting on Chemistry of Propellants, Palais de Chaillot, Paris, June 8-15.

Air Transportation Conference, **American Institute of Electrical Engineers,** Olympic Hotel, Seattle, Wash., June 24-26.

Third National Convention on Military Electronics, **Institute of Radio Engineers,** Washington, D.C., June 29-July 1.

STAFF CHANGES . . . Brig. Gen. Harold Q. Huglin, Hq. USAF, Wash., D.C., has been reassigned from duty with the Office of Defense Mobilization as Director of the Planning and Program Division, Plans and Readiness Area, to become **Military Adviser to the Secretary of Health, Education, and Welfare.** . . . **Maj. Gen. John J. O'Hara,** who was Chief, MAAG, Italy, has been assigned to **Hq. Eighth AF, SAC,** Westover AFB, Mass., with duty station at MacDill AFB, Fla., as Assistant to the Comdr, Eighth AF.

Maj. Gen. Norman D. Sillin, Comdr, Allied AF Northern Europe, and his Chief of Staff, **Brig. Gen. William A. Matheny,** have been reassigned stateside. General Sillin will be **Assistant to the Comdr, Hq. Command, USAF,** Bolling, AFB, Md. General Matheny will be **Assistant to the Comdr, Hq. AF Missile Test Center,** Patrick AFB, Fla.

Lt. Gen. Samuel Anderson, commander of Air Research and Development Command for the past two years, has been nominated by President Eisenhower to succeed retired Gen. Edwin Rawlings, as commander of Air Materiel Command at Wright-Patterson AFB, Ohio. The President has recommended that General Anderson be promoted to four-star rank.

Brig. Gen. Robert Taylor, 3d, who was DCS/Intelligence, Hq. North American Air Defense Command and Hq. Continental Air Defense Command, is the new **Chief, USAF Central Coordinating Staff—Canada,** at Ottawa, Canada, replacing **Maj. Gen. James C. Jensen,** who is now **Comdr, 30th Air Division** (SAGE), and **Comdr, 30th North American Air Defense Division.** . . . **Maj. Gen. Thomas B. McDonald** has been reassigned from Director of Logistics Division, J-4, US European Command, to the **1100th Personnel Processing Squadron,** Hq. Command USAF, Bolling AFB, Md.

Brig. Gen. Major S. White has been relieved from duty as Director of Medical Staffing and Education, Surgeon General, Hq. ATC, Randolph AFB, Tex., to become **Surgeon, ATC,** at Randolph, replacing **Brig. Gen. James G. Moore,** who is now **Comdr, USAF Hospital Lackland, ATC,** Lackland AFB, Tex. . . . **Brig. Gen. John R. Copenhaver,** formerly Surgeon, Alaskan Air Command, has been reassigned as **Surgeon, TAC,** at Langley AFB, Va.

Brig. Gen. Andrew J. Kinney, who was Comdr, Chanute Technical Training Center, Chanute AFB, Ill., was made **Chief of the Plans Branch, Plans and Policy Division,** SHAPE, APO 55, New York.

—MICHAEL B. MILLER

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VIEWS & COMMENTS

Pioneer IV Soars On . . . But

As pleased as all of us are at the giant accomplishment of Pioneer IV, its success should not lead to an attitude of "we've finally caught up." That we must brace for further "firsts" by the Soviet Union is suggested in this pointed editorial from the New York Times, *published the day Pioneer IV passed the moon on its way to join Russia's Mechta in eternal orbit around the sun.*

SOMETIME this afternoon the small human artifact named Pioneer IV will soar past the moon and go into space to become a new satellite of the sun. It is a magnificent achievement whose luster is not dimmed by the fact that the Soviet Union did it first two months ago. The congratulations which have been showered upon the scientists and technicians involved in this project are well deserved, and we are happy to join the chorus of acclaim.

There can be little doubt now that our rocket and space exploration program is beginning to make good progress. In the past three months we have sent into orbit around the earth the Atlas and Vanguard satellites and possibly also the Discoverer, as well as accomplishing the qualitatively superior feat of sending Pioneer IV so that it will be primarily controlled by the gravitational field of the sun rather than of the earth. To the technician these feats tell volumes about the increased power of our multistage rockets, their improved dependability, and the greatly increased accuracy of our guidance systems. To the rest of us these accomplishments speak vividly of the great progress made since the time, less than a year and a half ago, when Soviet Sputniks roamed the atmosphere alone, while Vanguard shots fizzled here on earth.

Nevertheless, rapid as our gains have been, we still have not sent into orbit satellites with useful weights equal to those of the Soviet Sputniks, while the Soviet Mechta satellite sent into orbit around the sun in January was far heavier than Pioneer IV. Nor will Pioneer IV come nearly as close to the moon today as did Mechta two months ago. The conclusion seems clear that we have not yet matched the Russians either in total rocket power or in accuracy of guidance system.

We have come a long way from the unhappy days of October-December 1957. The progress, the very great progress, which our scientists and technicians have made since then gives every reason to believe that we can catch up with the Soviet workers in this field if we are willing to give this important work the support it needs and deserves. But the able Soviet scientists are also working hard and we must anticipate that they will make more important firsts before we are finally able to pull up fully level with their capabilities.

—Reprinted with permission of the New York Times, *in which this material originally appeared March 4, 1959.*

Why No Russian Isolationists?

Adlai Stevenson came back from a recent visit to the Soviet Union quite struck by what he identified as the tremendous dynamism of the Russian Communist society, the deep sense of belief in the rightness of their cause among the people. In an A. Powell Davies Memorial Lecture given at Washington's Constitution Hall, he dwelt on this theme. Following is a significant excerpt from that address, which Mr. Stevenson delivered late in January.

IT IS impossible to spend weeks traveling around the Soviet Union as I did this summer without taking away an overwhelming impression of thrust and purpose in most aspects of Soviet life. The revolutionary ardor has cooled with time, but even the very pragmatic political leaders seem to believe profoundly in the truth of their way of life, and they are quietly confident that it will sweep the world in time. I think they sincerely believe that their methods, their aspirations, their dreams, make up the final truth about the nature of man and society; that collective man in the collective state is the ultimate unfolding of human destiny, the end of history, the "far-off divine event" for which mankind has been in long travail, the vision of "all things made new" that has haunted men's minds ever since Christianity thrust into human thought the intoxicating ideal of a perfected humanity.

From this conviction, if I have not overstated it, flow two consequences. The first is that no effort, no dedication, no sacrifice is too great that may help to realize the Communist Party's goals in Soviet society. The second is that no corner of humanity can be a matter of indifference to the Communists, because the whole human race is destined to become one in Communist brotherhood.

These are not abstract generalizations. Russia is a vast powerhouse of energy, all harnessed to the communal task of building the Soviet dream. The thrust of economic growth which adds a nine or ten percent increase each year to industrial expansion is one aspect of this energy. The vast sums available for science and research are another. The self-discipline and long hours put in by school children to train themselves as the scientists, technicians, administrators, and linguists of the new world order are perhaps the most significant measure of the resources of energy, work, and skill upon which Soviet leaders hope to draw....

The energy, the drive, the dedication in the USSR spill over into international affairs. In part, of course, this is the restless concern which all imperial powers must exercise, especially when the peoples they control are as restive and unreliable as the captive peoples in Russia's European empire. But Communist activity, planning, and efforts in trade

(Continued on following page)

and aid are not confined to areas of Communist control. They are worldwide, and there is no corner of the earth's surface which they think too insignificant for their attention. . . .

Why should they be so busy? Why so much work and thought? Why such diversion of resources? Why such patience through every setback, such forward thrusts through every point of Western weakness? Heaven knows, we only want to stay home. Why don't they? Why do we never meet an isolationist Communist? . . .

And I don't think there is any doubt about the answer. Part of it is simply needed foreign trade. Part is fear, the search for security through friends. And part is the historical centrifugal forces in Russia that have been pressing outward for a hundred years—to the Pacific, the Balkans, and the Middle East. But the important thing is that the Soviet Russians believe in their truth, as the men of the Western world once believed in theirs. They, not we, are firing the shots that are heard around the world—and also the satellites that orbit above it. The fact that their faith is in many ways an evil perversion of the great propositions that once made the blood course in our Western veins does not alter the fact that their tempo is dynamic and ours sluggish—even, I think, to ourselves.

But What About the Bomb?

Our British cousins at Aeronautics, *the respected British air journal, recently pointedly took the US Navy to task for what seemed to* Aeronautics *a rather antiquated and naive approach to tomorrow's warfare—the idea that bigger, better atomic carriers are going to be formidable tools of war.* Aeronautics *suggests that the Royal Navy's approach to future weaponry is far more realistic than ours.*

IN a well-known illustrated magazine of world repute the future shape of the United States Navy was recently revealed in drawing and photograph. Because it is so vital and controversial a topic, important as much to us and other NATO countries as it is to the Americans, we make no apologies for enlarging upon it here.

The new US Navy, when it is completed, will be the most powerful, nuclear-driven striking force the world has ever seen—and the most costly. Let us start by admitting that we agree with this opinion wholeheartedly. It will be a truly magnificent fleet. Which war was it intended for?

The hard core of this new navy will be the atom-powered aircraft carrier, which has a speed of forty knots and can stay at sea for two years without refueling. If need be, it can steam at high speed for long stretches without having to worry about running out of fuel.

To defend this carrier, when it cannot defend itself in bad weather, there will be escorting guided-missile cruisers and frigates whose weapons form a protective umbrella. And, to counter the threat from underwater, there will also be an escort of light helicopter carriers whose job it will be to keep dunking sonar detectors round the task force at regular intervals.

The resulting combination is one that any self-respecting enemy should acknowledge as impregnable. That is, provided he is not so unsporting as to lurk just outside the range of the guided missiles and loose off his stand-off atomic bomb during a spell of inclement weather. It would also be disrespectful, and bad form, for some very ordinary submarine to fire ultra-long-range atomic torpedoes and scupper the lot. But if you wage war by orthodox methods, some cads will always take advantage of you.

All of which amounts to our saying that we consider the Americans have misled themselves. Their conception of naval strategy seems to be based on the experience they gained in the second world war, which is no guide at all in an age that can whistle up fast atom-bombers and ballistic missiles. The American taxpayer may be willing to afford the luxury of a nuclear navy, but whether it is value for money is extremely debatable.

The stock answer to nuclear warfare is dispersion, and you can only disperse a navy by building many small ships and scattering them over the oceans. Individually they would then be open to attack by conventional weapons, for the nuclear weapon is too precious to waste on single ships. But in doing so the enemy must face counterattack, also with conventional weapons.

We should, therefore, say that the Royal Navy has diagnosed the trend of naval warfare more wisely than the US Navy, by concentrating on small protective fighting ships, sub-hunters, and sub-killers. A multiplicity of these can deal more effectively with the airborne convoy raider and the submarine than the big carriers and the guided weapons ships that must cling to each other for support. That is our view.

—*Reprinted from* Aeronautics, World Review of Missiles, Aircraft, Rockets and Space Vehicles, *February 1959.*

The Value of Insurance

IF THE United States could close the impending "missile gap" by spending $700 million annually for the next several years on intercontinental ballistic missiles, would not that be relatively cheap insurance? It is difficult to see a valid argument against increasing the Administration's defense budget. . . .

The argument that Strategic Air Command bombers, with their threat of swift and devastating retaliation, would compensate for a missile deficiency is a dubious one. The methods of defense against manned bombers are day by day becoming more formidable. . . .

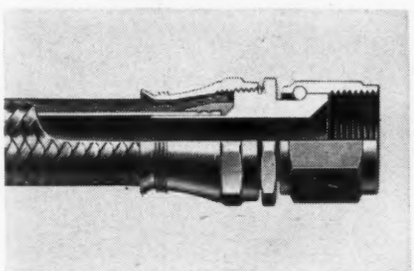
So it is reassuring to hear that Democratic leaders in Congress are predicting that extra funds will be voted. Among the chief proponents is Chairman George H. Mahon of the House Military Appropriations Subcommittee. . . .

If extra funds are voted, how best to spend them would remain a serious question. Should liquid-fueled missiles be pushed now to meet the emergency, or is it wiser to push faster on the solid-fueled Minuteman? Administration chiefs concede that Atlas production could be doubled if more money were spent, but advances in the Minuteman program have been coming more swiftly than expected. . . .

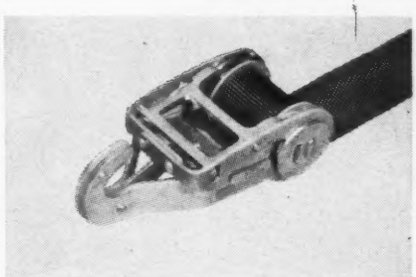
It is good to know that there is a strong movement within Congress to do all that can be done. . . .

—*Excerpted from an editorial that originally appeared in the St. Louis* Post Dispatch, *February 21, 1959.*

Aeroquip Products Are Designed to Improve Performance, Solve Air Force Logistics Problems

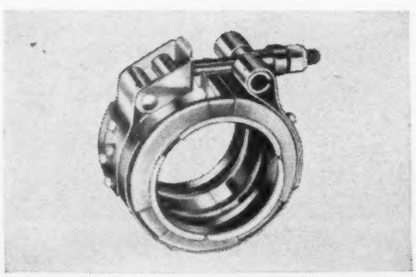


Aeroquip High Performance Hose Lines with Reusable Fittings for all aircraft and missile fluid systems, including Hose Lines of Teflon in a wide range of sizes and types with patented* ***"super gem"*** Fittings; precision tubing.



Aeroquip Ratchet Tie-Down Buckle secures cargo quickly, easily; permits in-flight adjustments of tie downs; speeds hook-up of barrier nets. Other products: WEBLOCK Straps, rope and web nets. (General Logistics Division).

Aeroquip Quick Disconnect Couplings for aircraft hydraulic, pneumatic, fuel and lube oil systems; for missile pneumatic, hydraulic, lox, acid, and other liquid fuel systems. Other products: Check out valves, breakaway connectors.



Marman CF-Series Flexible Coupling for fuel, bleed and air and lube oil lines provides dependable sealing of beaded tubing. Other products: CONOSEAL Joints, check valves, band clamps, straps, instrument clamps.

"super gem", WEBLOCK and CONOSEAL are Aeroquip Trademarks. *U.S. patent nos. 2,833,567 and 2,731,279. Teflon is Dupont trade name for tetrafluoroethylene resin.

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MISSILE TRACKING

SEA-LAB

This huge antenna is part of an electronic and optical system that RCA installed and is operating on the S.S. American Mariner. The purpose of the equipment, for which the ship has been refitted, is to provide the most precise data yet obtained at sea on missile flights over a range extending from Cape Canaveral, Fla., to the area of Ascension Island. The project is sponsored jointly by the Advanced Research Projects Agency, Department of Defense and the Army Ordnance Command. A scientific staff—most of them RCA personnel—will operate the equipment and report on missile performance from descent from space to final plunge, the data to be shared by all branches of the armed services.

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SHOOTING THE BREEZE

WITH THE EDITORS OF AIR FORCE MAGAZINE

Words, words, words. Which sounds better to you, 'brinksmanship" or "brinkmanship"? Adlai Stevenson and Stephen Potter, the British author of *Gamesmanship, Lifemanship,* and so forth, recently answered this question for us.

When *Life* printed a now-famous article on US foreign policy a few years ago, analysts immediately went into the field with commentaries on "brinksmanship." Note the spelling. In recent days, however, it has come to read "brinkmanship" almost universally (*see "Protracted Conflict," page 63 of this issue*).

Perplexed, we asked Potter, well entrenched "-manship" king, for a ruling on which spelling was correct. His answer came back: "In a long discussion between A. Stevenson and myself last time but one he was in London . . . we agreed that 'brinkmanship' is the correct spelling. One should completely relax, I think, when there are problems of nomenclature and etymology. We find that in this way the correct answer arises almost instinctively to the surface."

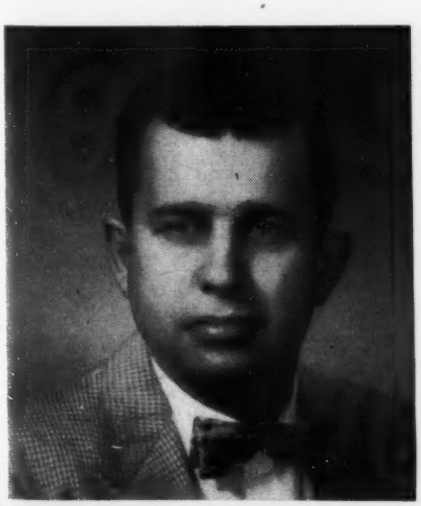
Now there's an answer with a nice conclusive ring, wordwise. You can't say the same about a similar discussion between House Majority Leader John McCormack of Massachusetts and Army Maj. Gen. Dwight E. Beach. The pair of words in question here was "aerospace" and "armospace," and the dialogue ran like this:

Rep. McCormack: We have heard witnesses of another service use the word "aerospace." What service do you think should have responsibility for military space activity?

Gen. Beach: Well, I never heard that term before. I've only heard of "armospace."

Rep. McCormack: Well, we encountered it the other day, a very sweet term, a very all-embracing term. As I said to someone in the Army, whoever coined it ought to be made a full general. . . .

There this semantic question was left hanging—for future historians as well as lexicographers.



If you've chuckled with us at George "Moon" Meyers (*See "Speaking of Space," page* 117), you'll be happy to meet his creator, Jack Tippit, left. Tippit has just begun a nationally syndicated two-panel strip, "Doctor Bill," a sample of which is at the right. Texas-born Tippit, a veteran of 495 combat hours with USAF, continues his "Moon" series for us as previously, glad to say.

The following exchange of verse resulted when television's Dave Garroway muffed a familiar Air Force name in an interview on his morning show some months ago. Lt. Col. John A. Powers, Deputy Director of Information Services for the AF Ballistic Missile Division, Inglewood, Calif., jousted thus for the Air Force in the poetic tilt; the poet is Capt. George Cullen, chief of Community Relations:

'Twas the morn before Christmas—the program "TODAY,"
Coast to coast people watching host Dave Garroway,
Throughout BMD the word had been spread
The Boss is appearing, the notices said;
Tell your wives and friends, "forget this not eever"
At 8:12 a.m. Dave interviews *Schreever.*

All eyes were upon him, the time drawing near
When what in our horrified ears should we hear
But D. G.'s cheery voice sounding out like a jiver,
"And now a few words with General *Schriver.*"

Somewhere hearts are happy and somewhere children play
But in the town of Inglewood our thoughts are less gay.
It was not so bad, though, Dave, after thinking it over
We count our blessings—you didn't call him *Schrover!*

Not to be outdone, Garroway shot back:

There once was a word interweaver
Charged with putting on General Schriever
But as a word striver
He came out with Schriver
And himself in position cantilever.

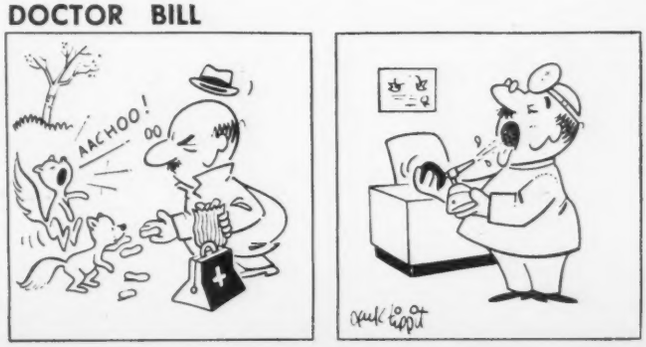
☆

Yes, there is a Senior Editor Claude Witze,* a familiar byline in this magazine. A military friend asked Editor Jack Loosbrock a while back whether the name was for real.

"I always figured it was a pseudonym," he said, "especially in view of the wide range of material the Witze stories cover. I could have sworn your editorial board was using the name collectively and took it from Clausewitz."

Claude is indeed real. He was also appreciative of the compliment.—END

DOCTOR BILL



NATO

THIS month marks the tenth anniversary of the North Atlantic Treaty Organization (NATO), perhaps the greatest experiment in collective security ever attempted. On April 4, 1949, the North Atlantic Treaty, the documentary foundation for NATO, was signed in Washington, D.C. Under its aegis the free nations of the West joined their strengths to resist the tide of Soviet aggression that had already exerted its ominous pressure in such areas as Greece, Czechoslovakia, Yugoslavia, and Berlin.

Signers of the original treaty included representatives of twelve nations: the United States, Great Britain, France, Belgium, the Netherlands, Luxembourg, Portugal, Denmark, Norway, Italy, Iceland, and Canada. In 1952 Greece and Turkey joined the pact, and in May 1955 the Federal Republic of Germany was admitted.

Today, as NATO enters its second decade, the fact that it has done so without having fired a shot in anger (or without having been shot at, for that matter) is in itself a tribute to the NATO concept. In this connection, one is reminded of an anecdote with which Lord Ismay, longtime Secretary General of NATO, used to answer those who posed the question of why such an organization.

"That reminds me of the story of a village in the mountains," Lord Ismay would reply. "A twisty road ran through it at one point, close to a steep cliff. There were a lot of nasty accidents there, so they built a wall. A visitor who saw the wall being built was quite relieved. It seemed like a good idea. Some years later the visitor returned to the village. The wall had crumbled, almost disappeared. When he asked a villager what had happened, the man shrugged and said, 'After we built the wall there were no more accidents. So we thought we didn't need it.'"

Like most analogies, while it dramatizes the NATO function in simple terms, the Ismay anecdote oversimplifies. NATO, and the military strength embodied therein, is indeed a wall or, as it is more commonly termed, a shield against aggression. As such it is primarily defensive in nature and cannot be counted upon to ward off indefinitely the thrusts of a cunning and determined aggressor. This can only be accomplished if, in addition to the shield, one carries a long, strong, and sharp sword coupled with the firm determination to use it if attacked. If NATO is the shield, then the sword is the long-range deterrent power of the Western Alliance. And, in the context of the times, this means primarily USAF's Strategic Air Command.

The current crisis over Berlin puts in sharp focus this interdependence of sword and shield. The validity of the concept has been challenged by some, including those who wish to enlarge their own "limited-war capability" even if such enlargement has to come through an erosion of the striking power of SAC. In recent months we have heard statements to the effect that the advent of a Soviet long-range nuclear capability will prevent our own strategic air forces from ever being used except in response to a prior attack against the continental United States.

Such statements have one thing in common. They emanate from individuals who have neither the responsibility, the capability, nor the experience to act as the "sword" in the NATO "sword-and-shield" concept. But they have attempted to use Berlin as an excuse to thicken the shield by shortening and blunting the sword. In so doing they have made points with serious-minded individuals, including some members of Congress, who are genuinely concerned about the state of our defenses.

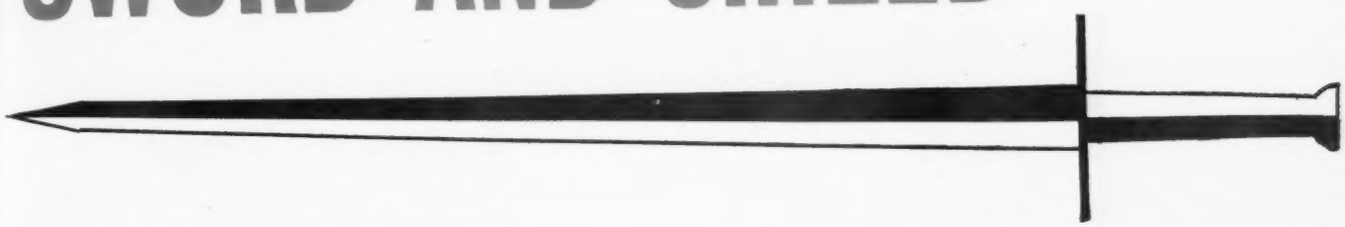
Fortunately for us and our allies, these arguments have thus far failed to impress either President Eisenhower or Secretary of Defense McElroy. As Senior Editor Claude Witze points out on page 19, our policy makers are holding firm to the idea that a Berlin-type crisis is not best met by throwing in more ground forces. Admittedly there is a risk of plunging into thermonuclear war, as both the President and Mr. McElroy have pointed out. But the use of ground forces in a Berlin-type situation is no guarantee against this possibility either, as some would have us believe.

The truth is that the longer and the sharper we keep our sword the smaller becomes the risk of any kind of war. Should the sword be blunted, even to the extent that it may still be capable of keeping nuclear war from our shores but loses its ability to reach out and deter aggression in Western Europe, then our Western allies would be in poor shape indeed.

Our national policy is still a policy of deterrence. It is the expressed desire of this government and of the people it represents to deter any and all types of wars insofar as this is humanly possible. But consider the published reports of the relative military strengths of the Sino-Soviet bloc and those of our allies; add in the liabilities inherent in operating a heterogeneous coalition, with long, exterior lines of communication, in the face of a centralized, interior-oriented threat, and one concludes that the free world's ability to deter local aggression primarily with local forces is well-nigh zero.

This was tried early in NATO's history. Original NATO planning set up the minimum forces needed to defend

SWORD AND SHIELD



Europe without the support of a strategic retaliatory effort. At the North Atlantic Council meeting in Lisbon, in 1951, it became obvious that these forces could neither be raised nor maintained. The choice then, as now, lay between the adoption of a global strategy, which combined the sword of strategic retaliation with the strongest local shield NATO could supply, or alternately to admit that Europe could not be defended at all. The latter choice, of course, was unthinkable.

The strategy of deterrence, whether of war against the United States itself or against the free world nations around the periphery of militant Communism, is a two-sided coin. One side consists of the ability to inflict unacceptable damage on the aggressor. The other is the enemy's belief that we possess the will and the resolve to do this should he go ahead and make his move.

The peoples of the free world, at least those imminently threatened by militant Communism, are counting on the US strategic retaliatory capability, and likewise on our will to use it in their defense, to offset the larger Soviet forces which threaten Western Europe. Further, the military forces of NATO have been organized and deployed so as best to complement the strategy of the sword and shield.

Any effort to pull the rug out from under the retaliatory portion of the free world defenses, without providing a solution as to how deterrence can be provided on a local basis, can only lead to European insecurity and an inevitable exploitation of that weakness by locally superior Soviet forces.

Whether or not the sword and shield strategy will remain valid forever, or is even the best strategy at this time, seems beside the point. It's the strategy we have, and if it needs revision, this should be done in an orderly manner within the councils of the nations involved and not in the public market place. Such an orderly revision would not content itself with kicking one leg out from under the stool without first ensuring that a satisfactory new one exists on which to lean our defenses.

The Air Force is confident that it can carry out its role as the strategic sword, providing it can maintain adequate forces in the high state of readiness needed to conduct a counterforce campaign. Those who challenge our willingness to come to the aid of our allies, in the face of growing Soviet long-range power, are motivated, not so much by a belief that the US cannot maintain forces adequate to carry out a deterrent strategy with a minimum of damage to ourselves, as by a desire to dip into the funds now devoted to these forces.

They would like to reduce our retaliatory forces to the minimum needed to be able to strike back solely in retaliation against an attack on the US or on its forces. Under such circumstances, retaliation becomes blind revenge—useless, senseless, needless. This kind of capability is far cheaper than an effective counterforce posture. On the other hand, it leads to a concurrent requirement to build a local deterrent and war-winning force at every point of the periphery of the Sino-Soviet bloc. Thus the sword would be shortened and blunted with the shield made thicker at infinitely greater expense while providing infinitely lesser real security.

In a recent press conference President Eisenhower said that "we are not going to fight a ground war in Europe." He said, "You have got to go to other means . . . think in much bigger terms" in defending Berlin and Western Europe.

This is reassurance that the will to use our deterrent strength, in defense of our allies as well as ourselves, exists as a matter of national policy. This determination carries with it, however, the concomitant responsibility of providing the Air Force with the tools it needs to "think," or more specifically, act "in much bigger terms."

It is at this point that national policy in terms of will begins to part company with national policy in terms of capability. Squeaking by a Berlin crisis because of today's retaliatory capability today does not solve the long-range problem of what to do about future crises should they arise in the time period of the missile gap, when the Soviets may be able to hit us harder than we can hit them back.

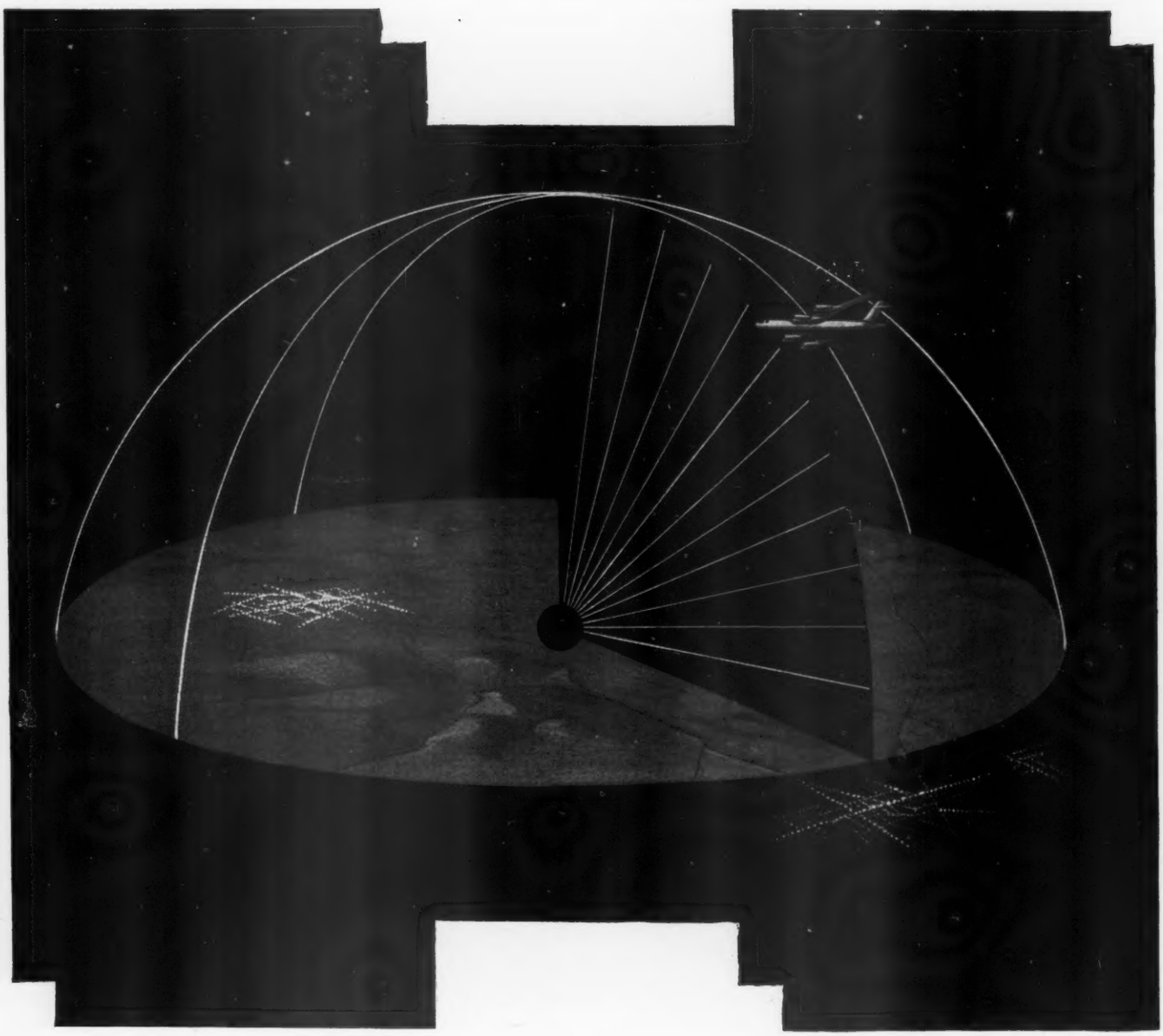
If that time comes the thickness of the NATO shield will not matter, for the Soviets will be able to reach around it with impunity, secure in the knowledge that we will not be able to unsheathe the sword in Europe's defense.

If there is to be criticism of our defense policies at this time, the criticism should be assessed in the context of reality. The President is right when he says, "What would you do with more ground forces in Europe?" But he can only continue to be right if the Soviet sword is never allowed to become longer and sharper than our own. If it ever does we can only stand by helplessly watching our allies bow their heads before the Soviet conquerors while awaiting our turn under the blade.

The first ten years of the North Atlantic Treaty Alliance have proved that collective security need not be a dream. Let us hope that its continued existence will be a prelude to a lasting, just, and honorable peace, rather than a reprieve before the execution.

—JOHN F. LOOSBROCK, EDITOR

THE UMBRELLA



THAT NEVER LEAKS

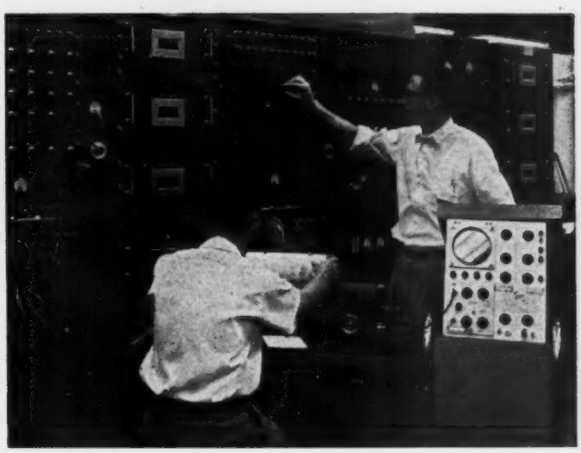
To achieve umbrella-like radar protection, Hughes' engineers have developed FRESCANAR—an electronics system which positions radar beams in space by electronic rather than mechanical means.

These unique three-dimensional systems are digitally programmed to instantly detect enemy aircraft flying at high speeds, even at low altitude. Linked to the 3-D radar antenna are mobile computers which simultaneously keep track of hundreds of aircraft and provide for high speed assignment of defense weapons.

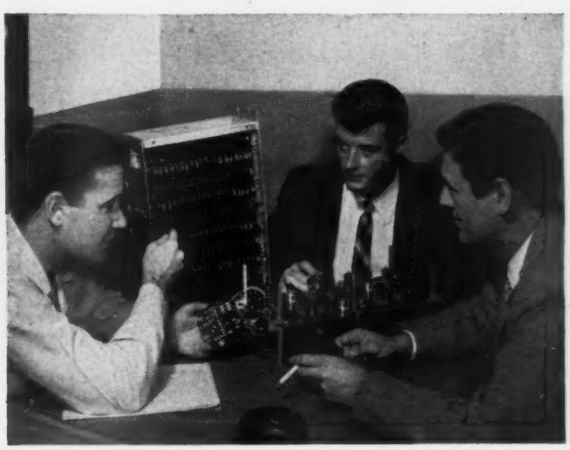
Hughes has over 30,000 people devoted to building electronics systems for airborne, shipborne and ground installations. More than 6,000 engineers and scientists form the creative nucleus of this effort.

Their job is to perfect new electronic systems designed to meet our needs for today and tomorrow. Already they are probing into the effects of nuclear radiation on electronic equipment, studying the problems of airborne electronics, delving into advanced microwave theory and application, developing plastic materials which stand up under extremely high temperatures, working on several new types of guided missiles, and examining communications on a spatial scale.

One of the nation's leading suppliers of defense materials, Hughes emphasizes reliability in all phases of manufacturing. Because of this, Hughes systems have proven dependable—even under the most severe and taxing environmental conditions.



Research & Development Engineers use REAC computing equipment as an aid in such complex problems as systems simulation.



Reliability of the advanced Hughes Electronic Armament systems can be insured only with the equally advanced test equipment designed by Hughes El Segundo engineers.

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It's another aviation first for Bell . . the first full in-flight conversion by a tilting-rotor fixed wing aircraft. Bell's XV-3 convertiplane made its metamorphosis in mid-air, to change from a helicopter to an airplane and back to a helicopter. Altitude was 4,000 feet, speed 115 knots, change-over was smooth in both operations. It took only 15 seconds for the XV-3 to make aviation history. With its ability for vertical take-off and landing plus the prime capabilities of speed and a wider operational radius, the convertiplane will give the Army a new weapon, tailored to today's tactical and logistical needs. Bell is developing the XV-3 for the U. S. Army under contract administered by the U. S. Air Force. The 4-place experimental model is a research prototype for future development into larger transport convertiplanes that hold vast possibilities for both military and commercial applications. Full conversion of the XV-3 is a major step toward this goal.

BELL'S XV-3 GOES FULL TILT

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MORE AIRLIFT... CAN CUT OUR BILL FOR DEFENSE

Where on the globe are military personnel or supplies needed? MATS C-133 and C-124 transports must be ready for the call.

Claude Witze
SENIOR EDITOR

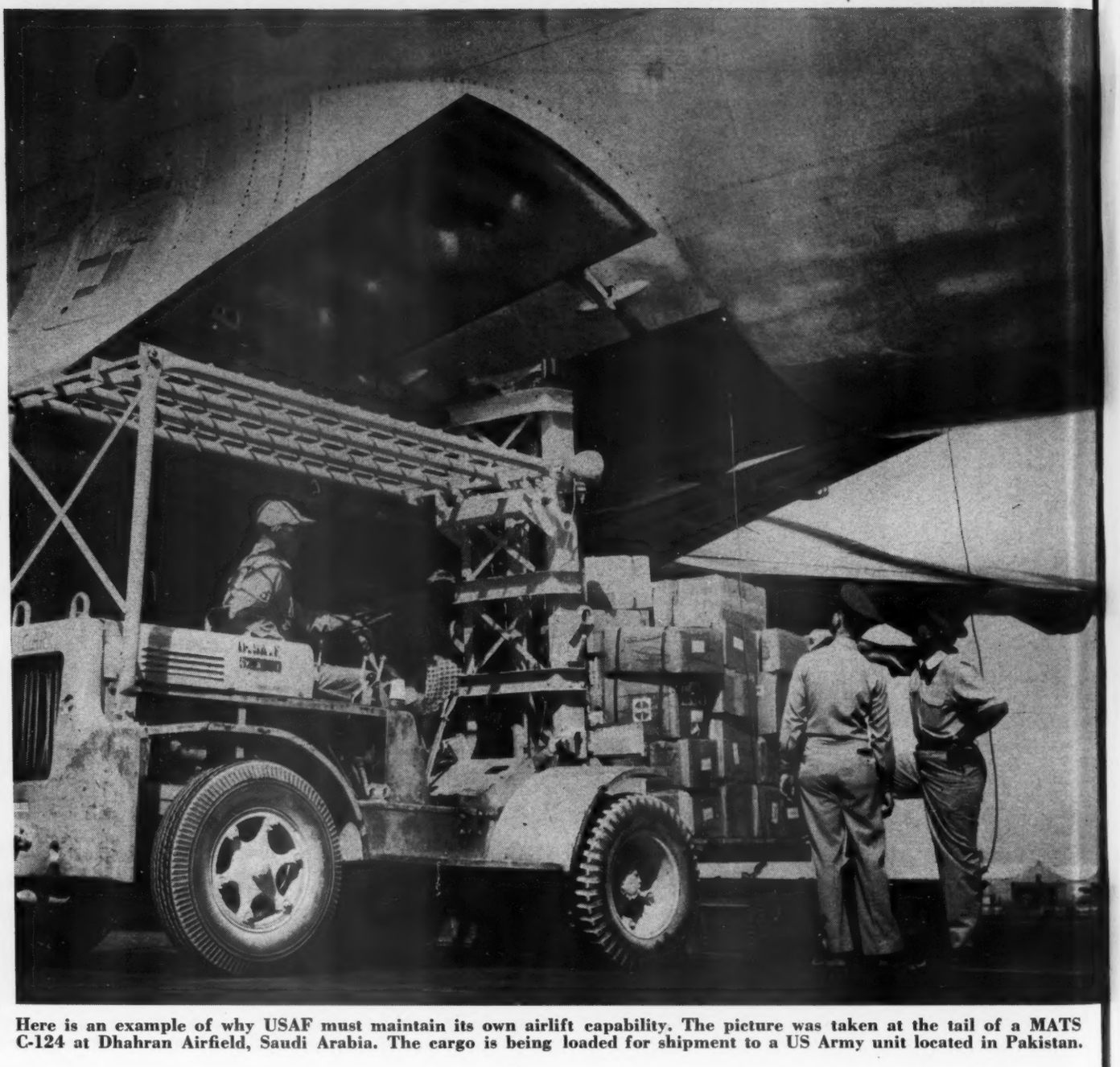
WASHINGTON, D.C.

OUT AT Scott Air Force Base, near Belleville, Ill., a program is being drafted to sell air transportation in the Department of Defense. Sparked by Lt. Gen. William H. Tunner, Military Air Transportation Service Commander, the effort will be based on the economic gains that can be realized from wider use of air transport. In an era when the budget sometimes seems to talk louder than threats to national security, General Tunner is in the unique position of being able to show how to save money.

An acknowledged expert on airlift—"Tunner Means Tonnage"—the veteran of the Hump, Berlin, and Korea, can legitimately use the same sales arguments indulged by representatives of Pan American Airways, American Airlines, and the contract carriers when they approach potential commercial customers.

General Tunner was new to MATS last year, and he had the good fortune to come to his command along with a new tool that can lift previous ceilings on the amount of airlift available to Defense Department "customers." The tool is the Industrial Funding Program established at the beginning of fiscal '59—last July 1. Under the industrial fund the Army, Navy, and Air Force, as authorized "customers" of MATS, must budget and pay for required airlift services on the basis of tariffs that cover all authorized costs. Under the old system the services were provided by MATS without charge, except in the case where MATS hired commercial carriers for the job.

(Continued on following page)



Here is an example of why USAF must maintain its own airlift capability. The picture was taken at the tail of a MATS C-124 at Dhahran Airfield, Saudi Arabia. The cargo is being loaded for shipment to a US Army unit located in Pakistan.

MATS now is in the position of being free to buy as much commercial transportation to overseas points as the Defense Department wants. There is no limit to overseas airlift other than the limit imposed by how much money the Army, Navy, and Air Force have in their pockets for overseas transportation. With a better realization of the economic advantages of using air transportation, General Tunner sees almost no limit to the amount of traffic that can be generated, with more bang for the buck as a clear by-product.

This is an old story both to General Tunner and to the Air Force. USAF itself has cut its jet engine procurement by twenty-two percent in the past few years by abandoning surface transportation for the replacement pipeline. With jet powerplant prices ranging from $100,000 to $200,000 apiece, it is not difficult to prove that carrying them by air effects real economies.

But it also is a fact that full utilization of this economic advantage is not being realized throughout the defense establishment in a period when budget problems are foremost here at the Pentagon. Within the past few weeks the General Accounting Office has criticized the Navy for being too slow about engine overhaul. Navy, according to GAO figures, is spending about $100 million too much for engines, and most of the trouble lies in the 275 days it takes to get a Navy engine through the pipeline. The Air Force allows 150 days. How much of this Navy lag could be overcome by wider use of air transport was not explored by GAO, but from USAF experience it appears clear that the engines spend too much time on the surface.

Wallace Neth of Seaboard & Western Airlines, one of twenty-four commercial carriers with MATS contracts, chats with General Tunner at headquarters, Scott AFB. Mr. Neth was one of the top airline and Air Transport Association officials who attended a two-day conference at Scott last December. At the meetings, General Tunner and his staff discussed ways to bring MATS and the commercial industry into closer working relationships. In addition, the commercial men were briefed on MATS operations, the industrial fund program, and how the commercial contractors and Civil Reserve Air Fleet find a place as resources on which General Tunner can depend to carry out his mission in both peace and war. The system will be more efficient and effect economies for the Defense Department, General Tunner holds, if more demand is generated, permitting wider use of commercial lines.

Contract carriers do a big part of the MATS job. An Air Force family here boards a Flying Tiger Constellation to go overseas.

Another example, cited without malice, is the economic fact that the Army could substantially increase its effective size if it would utilize more air transportation. It is a common sales argument of the commercial airlines that a corporation, moving an executive from office A to office B, can save money and manpower by getting him off the ground. If a man is paid $40 a day he can burn up $280 worth of his productive time traveling by rail and steamship from this country to Germany or vice versa. If he goes by air, the trip can be made on $80 worth of time.

To the Army, which is feeling the strong pinch of manpower ceilings, the economy can be realized in terms of personnel as well as payroll. It is estimated that in each quarter of the year the Army uses surface transportation to move about 50,000 men overseas in one direction or the other. This is the inevitable result of our widely scattered military obligations during the cold war, and there are a lot of other soldiers who are given the priority to fly. If *all* the men were put on airplanes there would be an average saving of two weeks' transportation time for the 50,000 on trains and ships. The result—a time saving equivalent to adding 8,000 men to the Army, full time for one year.

General Tunner and his staff are convinced that the industrial fund policy provides a vastly improved atmosphere for wider utilization of airlift by the Defense Department. They point out that both the Army and the Navy have studied the USAF program and verified that it is

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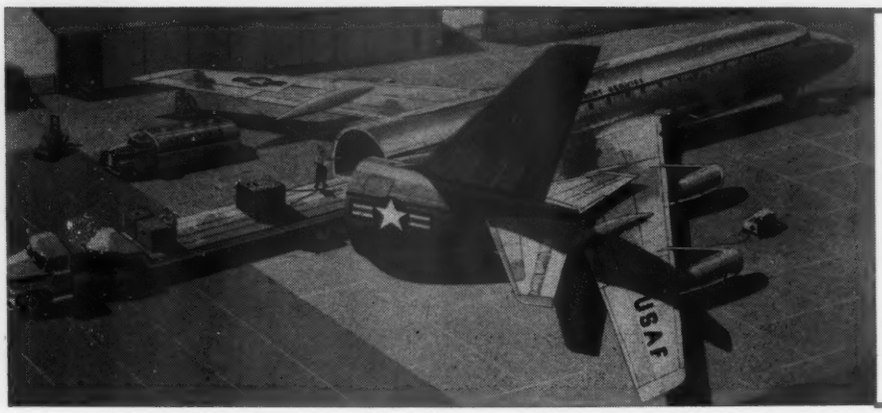

Convair Model 600, is a high-speed jet transport, designed for MATS. The swing tail will permit easy cargo loading and troops also can be carried. It is needed as the "race horse" of the MATS fleet to serve SAC in time of war.

the most profitable way to handle a huge amount of traffic. But the old MATS, prior to industrial funding, never was able to guarantee enough airlift to fill the demand. Hence the big customers outside of the Air Force itself have hesitated to commit themselves to wider use of airlift.

A new effort to expand use of airlift, in view of the perennial fight between MATS and the commercial carriers, would seem bound to stir up a new hornet's nest in the spring of 1959. Congress, goaded to some extent by the commercial overseas carriers, continues to quiz MATS about its operation, study the traffic and cost figures, and express opinions—as diverse as those on more political subjects—about how MATS should be used.

About a year ago a subcommittee of the House Committee on Armed Services, headed by L. Mendel Rivers, South Carolina Democrat, gave MATS a clean bill of health. At the same time it deplored the kind of rough talk it had been hearing from those who held that MATS "competes with civil air carriers." The committee said the facts presented by certain spokesmen "could not be further from the true situation."

Almost at the same time another group, part of the House Committee on Government Operations and headed by Chet Holifield, a California Democrat, issued a longer and more detailed report that was highly critical of MATS. It concluded that the Department of Defense should expand and stabilize its use of commercial air service, acknowledging that there is a need for the MATS capacity to meet wartime requirements.

There were other investigations, and more of them are under way in the Eighty-sixth Congress. If you are sufficiently naive—and a reporter frequently has to appear that way—it is logical to ask how the MATS situation in 1959 differs from the MATS situation in 1958.

The answer you will get at Scott AFB is that Bill Tunner is now prepared, with the aid of the industrial funding concept, to promote a wider use of air transportation. The answer from airline representatives is that so far they have seen no concrete evidence of a change in policy and that they fear any growth of Defense airlift requirements will be an excuse for MATS to continue what one of its more bitter and unfair editorial enemies has called its "cancerous growth." This school holds that MATS is building up a substantial empire in somebody else's backyard, running the biggest airline in the world with the taxpayer's money. It argues that MATS should be almost as immobile in peacetime as a ballistic missile squadron, holding its birds quietly on the ground until the crisis arises.

This is where we get back to the MATS mission. General Tunner recently described it in these words:

"The mission for which MATS is held responsible is to maintain, in being, the military transport forces, the service forces, the en route bases, and the air routes to meet the approved wartime requirements of the Department of Defense as established by the Joint Chiefs of Staff. Under the direction of the Chief of Staff, USAF, MATS will:

"A. Maintain a D-day state of readiness within the transport fleet.

"B. Establish and maintain the necessary air routes.

"C. Establish, maintain, and operate communications, rescue, weather, and photographic and charting services."

Aside from the skepticism expressed by some airline representatives, this reporter can find no evidence that General Tunner's determination to encourage use of more air transportation within the military is an effort, covert or otherwise, to do other than perform this mission. With MATS, as with the airlines themselves, there is a near-painful requirement for more modern equipment to replace the obsolete or obsolescent aircraft now in use.

It is true, in this connection, that MATS sees a requirement for modern jet transports. An example is the swing-tail cargo/troop version of the Convair Model 600. They are required, according to General Tunner's staff, for the strictly wartime demands imposed by the Strategic Air Command. Wherever the B-52s and their compatriot KC-135 tankers land, MATS has a requirement to provide supply and get it there at a speed comparable to that of the B-52 itself. In this sense, as it should be, the transport capability is part of the weapon system.

General Tunner calls this jet his "race horse." Next to it in the stable, he says, there must be a Percheron—the draft animal, somewhat ungainly but capable of hauling the big loads. For this work today's C-124 will pass away. Current favorite replacement, still only in the talking stage, is the proposed Lockheed GL-207. This will be a bigger C-130 Hercules, with longer fuselage and wings, powered by the Allison T-61 turboprop engine. Specifications call for an ability to carry 50,000 pounds of payload for 3,500 miles or 20,000 pounds over 4,800 miles.

The number of aircraft, MATS reiterates to all queries, will depend, as now, on wartime requirements established by the Joint Chiefs of Staff. General Tunner is firm in his emphasis that the D-day mission is the only reason for MATS' existence. The peacetime operation is a training program, and the peacetime airlift is a by-product.

If D-day arrives, General Tunner says, the war plans must be executed at once. In his own words:

"There is no move made by MATS—yesterday, today, or tomorrow—that does not duplicate the moves we would make in war. The mission that we would have to fly in

(Continued on page 45)

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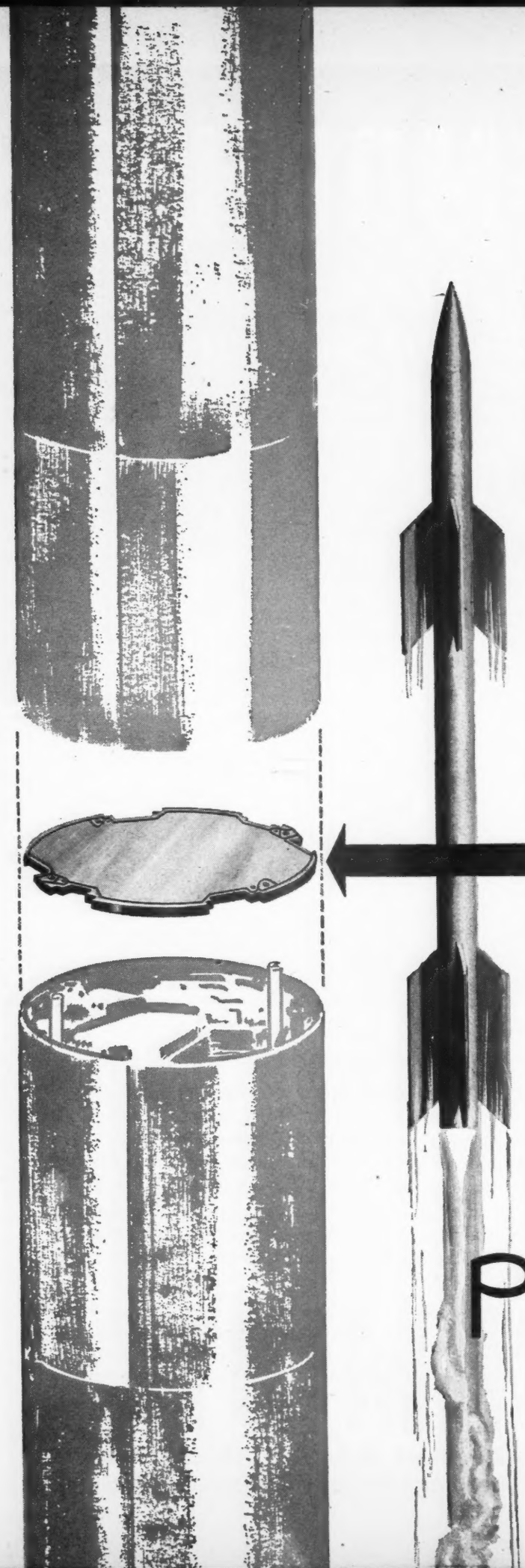

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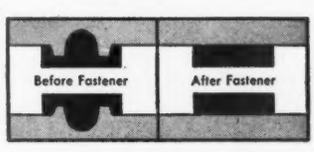

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It is in carrying out this program that MATS runs head on into the charge that it is competing with commercial carriers. Even more important than the type of traffic as a bone of contention is the utilization rate of MATS aircraft. The goal General Tunner has fixed is six hours per day per aircraft. He says this is the amount necessary to ensure quick acceleration in event of war, an acceleration that would involve increased loads not only on the airplanes but on MATS terminal facilities, service operations, transport-control centers, communications, weather service, and base-support facilities. These necessities lead to the MATS precept that "you can't can airlift."

There is a school of thought—particularly among the commercial interests that look upon MATS as a rival but also supported by some military men with less experience than General Tunner—that holds that a utilization rate of less than two hours will suffice. These people contend that MATS transport can and should be flown only for pilot and ground-crew proficiency. It is argued that MATS can and should cut utilization, put greater emphasis on the in-commission rate or, in TAC terms, simple combat readiness.

In the current fiscal year MATS was operating under a congressional edict that it had to spend at least $80 million with the commercial airlines. With effort, MATS expects to meet the goal. General Tunner has pointed out that this is not the whole story because it covers only overseas contracts. Total Defense Department contracts for airlift to support the military must be added to the bill for air transportation on scheduled runs or common carriage. The figure then mounts to about $300 million. The civil carriers, in short, now get about fifty-seven percent of the Defense business.

To increase this figure, percentagewise and in cash, the airlines need the program of airlift salesmanship in the department that MATS now sees possible under the industrial fund system. Before it can be realized, there are other stumbling blocks in the way of more amicable relations with the contractors. A major one is the requirement under the Armed Services Procurement Regulations that all contracts must be subject to competitive bidding, with small business entitled to the same consideration given to major airlines. The regular carriers, by which is meant the common carriers subject to Civil Aeronautics Board regulation, feel strongly that military contracts granted under a bidding system circumvent the law and give the government an advantage over other shippers.

During the crisis in Lebanon last year, MATS flew 314 trips to the Middle East and continued normal traffic.

This problem, as cited by the Holifield committee last year, is one of law and policy and economics rolled into a single military-commercial headache. The law requires the carriers to charge fair rates and rates that will ensure a profit. If the Defense Department, under the ASPR bidding system, can get a real bargain it may be that the public will have to pay more to make up the difference.

Equally as irritating to the major airlines is the opportunity open to relatively small operators. As small businesses they must prove they have proper equipment and the competence to fly an overwater route; once this is established to the satisfaction of MATS, the law does not permit discrimination against them because they are not regulated common carriers. At the same time, in case of a war emergency MATS would call on the Civil Reserve Air Fleet, which is composed of about 300 airplanes operated by more than twenty airlines. There is a strong feeling that this wartime partnership, of which both MATS and the airlines are proud, is not strengthened by the consideration given to non-CRAF operators in competitive bidding.

CRAF operators are invited to bid on all contracts but procurement directives forbid preferential treatment for them. The result is that the major carriers in CRAF have not shown any great desire to take part in the peacetime augmentation of MATS. MATS is living with the regulation, but it would be pleased to see a legislative remedy that would let it contract only or primarily with the operators on whom it will depend in time of war. There is irony in the fact that when the Eighty-fifth Congress ordered $80 million spent for commercial service it also said carriers which qualify as small businesses should be utilized to the fullest extent practicable.

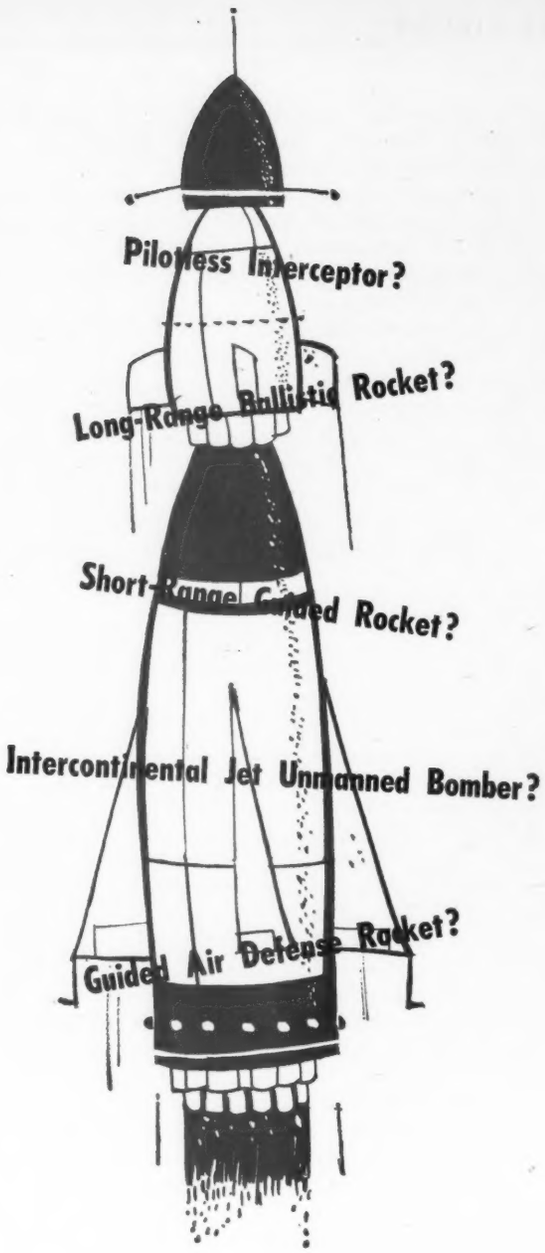
There is no doubt that a sales effort is needed, as General Tunner has proposed in his short regime at MATS. Perhaps not all the effort should be put into increasing the demand for airlift until the ground rules are straightened out by the people who made them.—END

As this issue of AIR FORCE goes to press the Senate Aviation Subcommittee headed by A. S. Mike Monroney, D., Okla., is preparing to study MATS airlift requirements with General Tunner at a Pentagon meeting. A number of other congressional committees also are prepared to continue probes of the command. It is understood on Capitol Hill that Mr. Monroney is giving serious consideration to a joint civil-military development program to provide a new cargo plane. USAF probably will not press for such a bill. It does look with favor on the Lockheed GL-207 proposal.

Space-Age Semantics

WHO THREW THAT MISSILE?

Brig. Gen. Thomas R. Phillips, USA (Ret.)



NOW THAT the scientists are married to the military (a shotgun marriage, it must be said, and not without tribulations) it is high time that someone took umbrage at the effects of this union on the military language.

Take missiles as a sample of baleful scientific semantic influence. Only a scientist would call a guided air defense rocket, a pilotless interceptor, a long-range ballistic rocket, a short-range guided rocket, and an intercontinental jet unmanned bomber all by the same generic term: "missile."

A "missile" is defined by Webster as a weapon or object thrown, or projected, or intended to be projected. The definition applies to all of those named, and it also applies to a bullet fired from a rifle, to a shell fired from a gun, to the boulders that once were thrown by catapult, and to the small stone that David hurled from his slingshot to kill Goliath.

Words matter. Not very long ago it was announced that the United States possessed an "operational intercontinental missile." Thus the public was convinced that the United States had accomplished the same thing as the Soviet union, which had, a few months earlier, announced successful tests of an "intercontinental ballistic rocket." What the United States had flown was the Snark subsonic jet pilotless bomber, whereas the Russians had tested an 18,000-mph intercontinental ballistic rocket. The vast mass of the reading public probably thought that the United States had done the same thing.

How should these so-called missiles be designated so that one can recognize what they are? Some are easy to designate simply and others not so easy. What we call a "ballistic missile" only needs to be termed a "ballistic rocket." The term "ballistic" denotes that it is aimed and not guided. Unless otherwise described, it is a surface-to-surface rocket. Definitions are needed that will be universally understood as to range. We now have short, mid, medium, intermediate, and intercontinental ranges. None has any precise meaning. In artillery, the terms light, medium, and heavy are quite universally agreed on and understood as to caliber. The same terms are applied to bombers with some exactness. With ballistic rockets it

(Continued on page 51)

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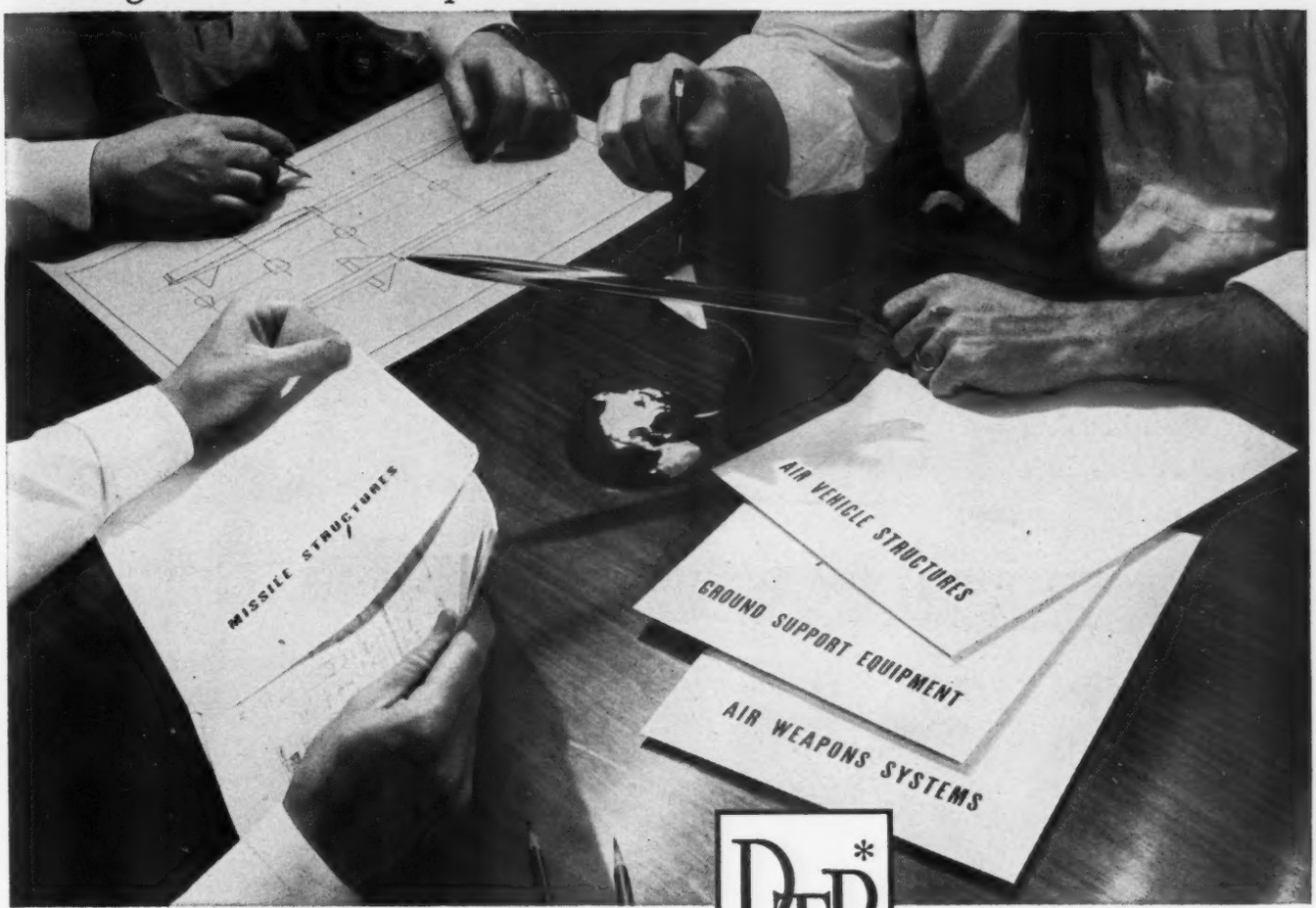

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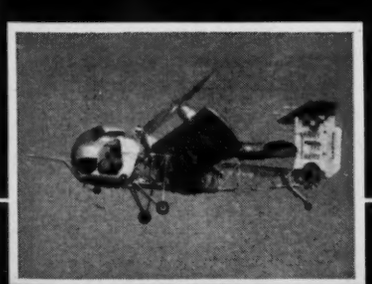

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should be possible to categorize by some term the five or six types needed with ranges between 200 and 5,000 or more miles.

In the air defense field the Bomarc, which is a rocket-launched, ramjet, pilotless, guided interceptor, is called a guided missile. But so is the Nike-Hercules, which is properly designated as an air defense guided rocket. It really becomes confusing when the Talos also is called a guided antiaircraft missile. Talos is a rocket-launched, ramjet, unmanned, guided interceptor, but its configuration is close to that of a true rocket. It should not be called a rocket because rocket implies the use of rocket engines and fuels. It should not be called an interceptor because that word has become identified with wings, and those on the Talos have become so small they no longer are wings. This one I shall leave to the experts.

The air-launched weapons can be termed "air-launched, guided, air defense rockets," "air-launched ballistic rockets," and "air-launched, guided, assault rockets" for the air-to-surface guided rocket, or "air-launched, guided, unmanned bomber" for the jet-engine type of air-to-surface weapon.

There must be some bright boys who can solve this better than I can. The Russians, it may be noted, appear to call the shorter-range ballistic rocket, "rockets," and the intermediate- and long-range ballistic rockets, "missiles." Why, I do not know. It may be that the long-range ballistic rockets have a meaningful Russian term that is translated into our word "missile" for lack of a better word.

In all fairness, I must admit that semantic problems antedated the influx of scientists into the military community. When the old cavalry managed to get control of the small Army armored force about 1936 or 1937, it promptly renamed it the Armored Cavalry. Then it attempted to develop armored tactics along the line of cavalry tactics, which were utterly inappropriate. Today we find the Air Force, now in control of long-range ballistic rockets, talking about wings. The Air Force apparently is thinking about ballistic rockets in terms of bombers and is naming the rockets boys' organization in terms of airplanes.

This is bad in two aspects. The rocketmen need their distinctive appellations, not holdovers from airplanes. Their highly technical tasks interest quite a different breed of men from those who have been thrilled with the freedom of flight and their mastery of what only birds could do. The morale problem is one of romantics and mechanics. The mechanics, technicians, and scientists who nurse their ugly beasts from year to year, and never get off the ground, have a morale, interest, and devotion of their own that has a quite different basis from the romance of flying. If this morale is to be real and not a second-hand suit inherited from the flyers, the terminology of rocketry must be its own. It would make more sense to call a ballistic rocket unit a "nozzle" or a "nose cone" than to call it a "wing" or a "squadron," a term brought over from the cavalry.

Another symptom of traditional thinking is the new and handsome emblem of the "missile wings." The emblem is worn *below* Air Force flying ratings. If rocketry is their business, why should these men not display it proudly on the left breast and put the flying rating over on the right. The morale of the men who will sit year after year nursing their mighty monsters, waiting, we hope, never to fire them, not even able like a fireman to take his red wagon around the block and ring the bell occasionally, needs every means available to enhance the prestige of his task. Morale will be harmed to the degree that his special skills and service are not especially recognized with a service terminology of its own. Forcing flying ratings, thinking, and strategy on an essentially different service will hurt it.

The marriage of science to the armed services is permanent.

The scientific marriage to the armed services is permanent. Indeed, more and more members of the armed services will become scientists. The care and feeding of scientists, in and out of uniform, are problems that will grow more and more acute. The military man dealing with the civilian scientists will have to forget the weight of the insignia of rank he wears on his shoulders. He will have to deal with ideas rather than with military discipline. The brilliant idea of the worst dub ranks higher than the stupid idea from within a four-star uniform.

And the scientists have an accommodation to make also. The military ideas represented by respect for authority, discipline, and team play are the fundamentals of any worthy organization, but they are the beating heart of a military organization where obedience to authority, discipline, and teamwork are matters of life and death to the individual and the nation whose uniform he wears. The sloppy scientist may be expressing his revolt against authority, which he feels has little place in his world of imagination and ideas, but he is not a very good scientist if he fails to do a little thinking about the need for and validity of military authority. If some of the representatives of military authority are narrow and authority-proud and use authority in place of ideas, let the scientists remember that authority is vital and that military organization provides and must provide for continuing authority, regardless of the failings of the temporary wielder of it.

This marriage is going to work because it has to. On both sides there must be an understanding of the special qualities and necessities of the other to perform his task. Today there are too many supercilious scientists and too many military woodenheads condemning each other, too many scientists contemptuous of authority, and too many military using authority instead of brains. The problem is here from now on, and those who fail to understand the other are performing less than the service they owe the nation.—END

General Phillips began writing on military affairs long before he shed his Army uniform to become military analyst for the St. Louis Post Dispatch *in 1951. As long ago as 1933 he contributed an article to* The Saturday Evening Post, *which he says he cut from 50,000 words to 5,000. The same article was reprinted in* The Reader's Digest, *cut to 1,500 words without, in the General's words, "skipping an idea!" He still thinks words are important, as long as the accent is on accuracy rather than on quantity.*

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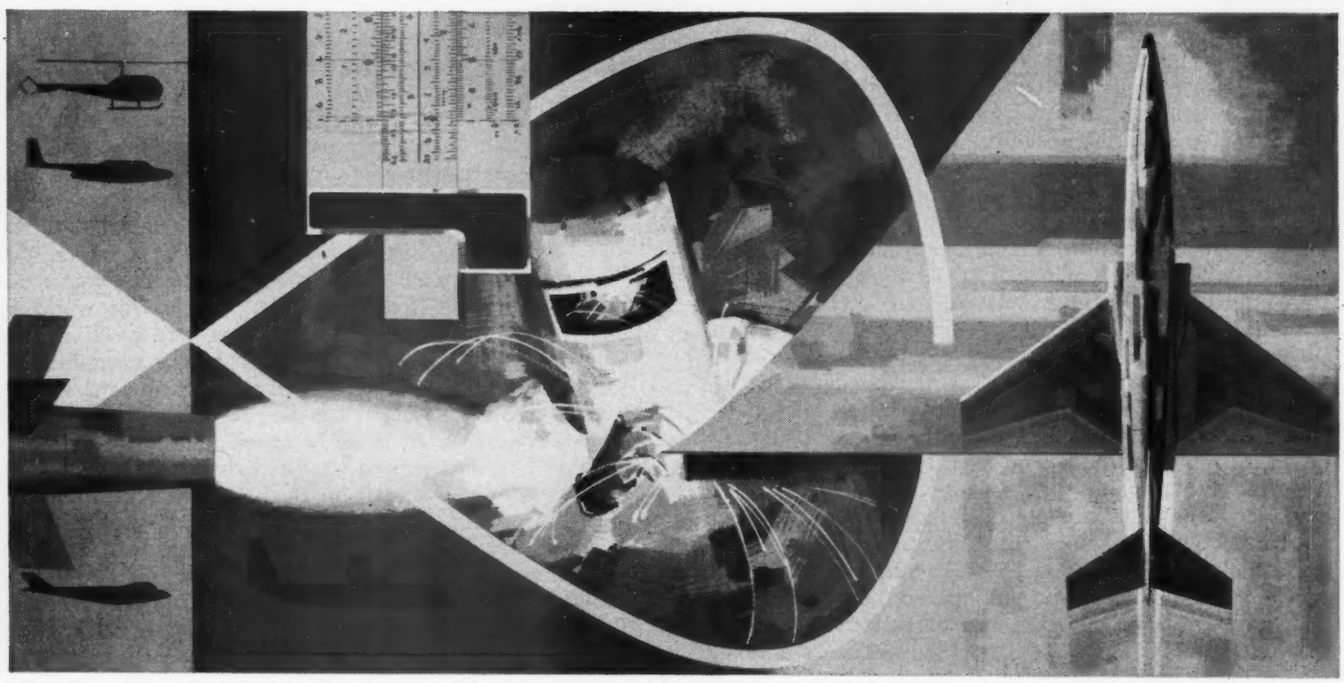

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A Red Airpower Feature

A Close Look at FACEPLATE

How the Soviet Air Force's MIG-21 Stacks Up

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The aircraft had been rather hastily put together for the show, and prior and subsequent test flights showed many shortcomings that caused Artem I. Mikoyan, brother of Russia's most recent visitor to the US, to take his design team back to the design boards for more work. They worked fast, and by October of 1957 the Russians had a newer version of the same airplane in series production.

Today a fair number of fighter squadrons of the IA-PVO, the Soviet interceptor command, have been armed with this airplane. It is evident that the Russians regard the MIG-21 as an important airplane, for they also have been giving it to those satellite powers which form so much of Russia's first line of defense. The MIG-21 has been observed in China, and the East German Air Force today is being retrained to the airplane.

For all practical purposes, the MIG-21 is the first Soviet fighter capable of penetrating speed ranges near and beyond Mach 2. It represents the best the Soviets have in production today, and its development in many ways parallels that of fighter development in the US, though again, the Soviets have not been able to achieve the performance of US fighters of the same time period.

In general outline, the MIG-21 is similar to the MIG-19, though performance is much better. Sweepback of the leading edge of the wing is very high—about fifty-seven degrees, which makes for resemblance to both the MIG-19 and the English Electric P.1.

The airplane is reported by German sources to perform well in the transonic region, though it employs none of the "coke-bottle effect" that has been used in the US. Flying characteristics of the MIG-21 at low speed, however, are not so good. The aircraft is rather unstable, and so it does not make a good ground-support aircraft.

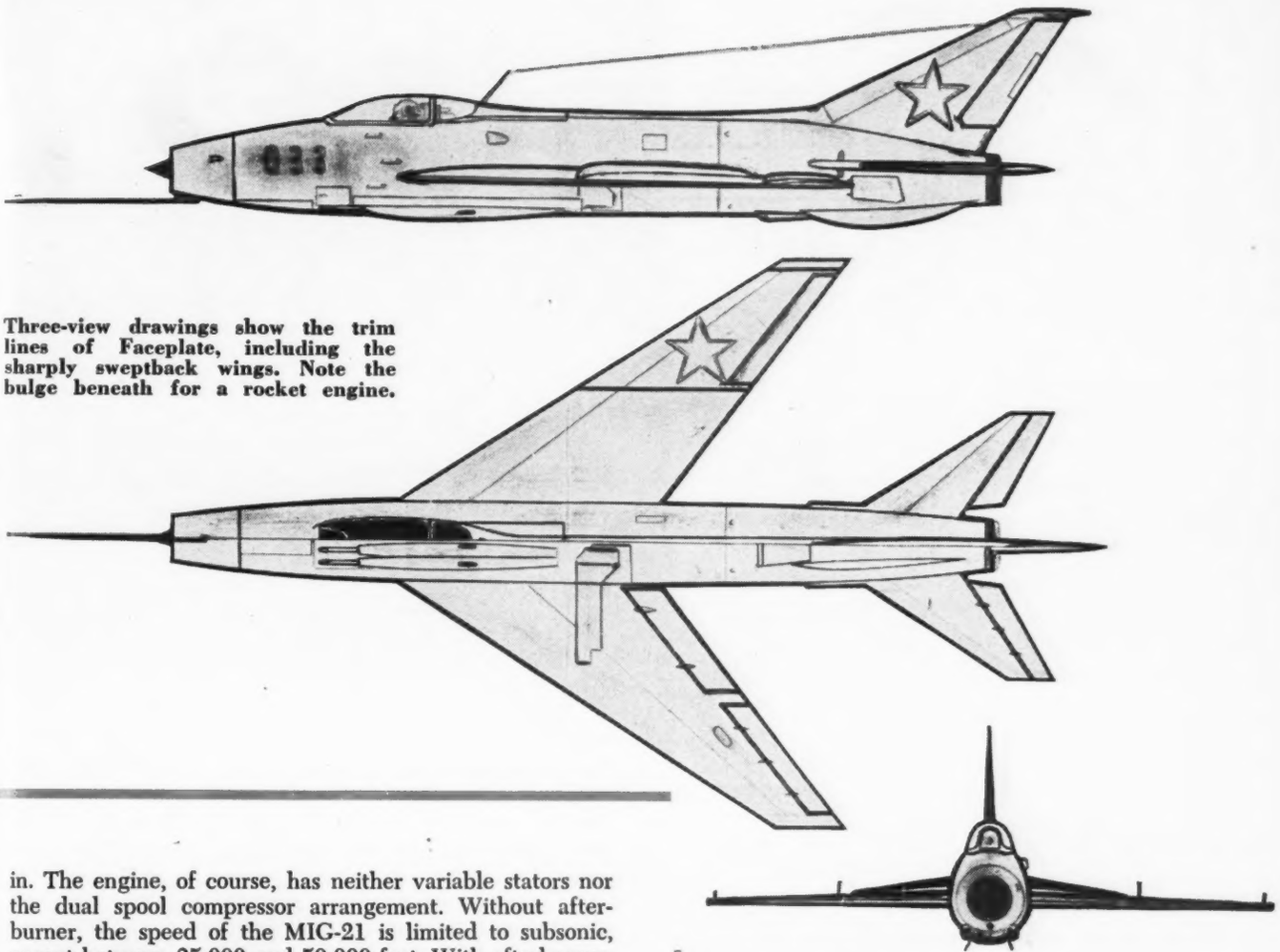
The profile thickness of the geometrically untwisted wing varies from six percent at the root to four percent near the tip. The profile is near symmetrical. The boundary layer fences, so common to most all Russian aircraft, give rise to the belief that there is no leading edge flap.

Ailerons appear to be conventional. The wing loading is relatively low, and the plane's over-all aerodynamic performance is not the best. The Russians have sought to compensate for this by using a lot of thrust. Even so, the MIG-21's absolute ceiling is about 6,500 feet less than the generally acknowledged capabilities of its western counterparts, unless the rocket engine carried under the tail is used. The rocket engine is a liquid-fuel type which could raise the absolute ceiling by about 9,300 feet for eighty to ninety seconds. More likely, however, the rocket engine is designed to improve climb performance during the intercept portion of a mission. Thrust of the rocket engine is put at 4,400 pounds.

Powerplant in the MIG-21 that is now in production comes as a surprise and a revelation. It is a modified AM-3, also used in the TU-104 jet transport. It is equipped with an afterburner, of course, to give the MIG-21 its supersonic performance.

Specific fuel consumption of the engine has been somewhat improved, to where it now is 0.87 pounds per pound of thrust per hour, though this is still quite high when compared to such turbojets as the J-79. Furthermore, the AM-3 is quite heavy. Static thrust of this latest AM-3 is put at 18,000 pounds, which is quite good, except that the thrust curve falls off sharply with altitude.

Specific fuel consumption goes up to 2 to 2.2 pounds per pound of thrust per hour when the afterburner is cut



Three-view drawings show the trim lines of Faceplate, including the sharply sweptback wings. Note the bulge beneath for a rocket engine.

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The air intake is formed much like a pitot tube, with central diffuser bevels to give a two-stroke diffusion. It is quite an efficient arrangement up to the speed limits indicated, after which it becomes something of a handicap to the aircraft's speed.

The rate of descent during landing probably is quite high, and deceleration is aided by landing brakes extending laterally from the fuselage similar to earlier Soviet interceptors.

The wheels of the landing gear retract into the fuselage, though the shock absorbers of the gear are in a more lateral position, and retract into the wings. Usually the airplane is observed with high-pressure tires, but it is believed that larger, low-pressure tires could be substituted for operations off grass plots. The gear is meant to withstand the shocks of operating off grass plots, though a short-run takeoff might require that the rocket motor be cut in for this type of operation.

The radar aboard the MIG-21 is all-weather in scope. Sighting and firing are adapted to air-to-air missiles, and the four Type M-101A missiles carried under the wings are designed to home in on target by following infrared rays.

Below the nose, as with most Soviet interceptors, there are three cannons, two of 20- and one of 37-mm. caliber. A retractable tunnel with eighteen nonguided missiles is carried just behind the nose wheel section. The missiles can be replaced with bombs—though it is not certain whether or not A-bombs could be carried.—END

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Static thrust: 18,000 lbs.; 22,400 lbs. with afterburner
Crew: 1
Total length: 56.4 ft.
Fuselage length: 50.2 ft.
Height: 14.8 ft.
Span: 39 ft.
Wing area: 363.8 sq. ft.
Wing aspect ratio: 3.1
Structural weight (with equipment): 15,456 lbs.
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Crew: 264 lbs.
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Useful load: 14,784 lbs.
Takeoff weight: 31,240 lbs.
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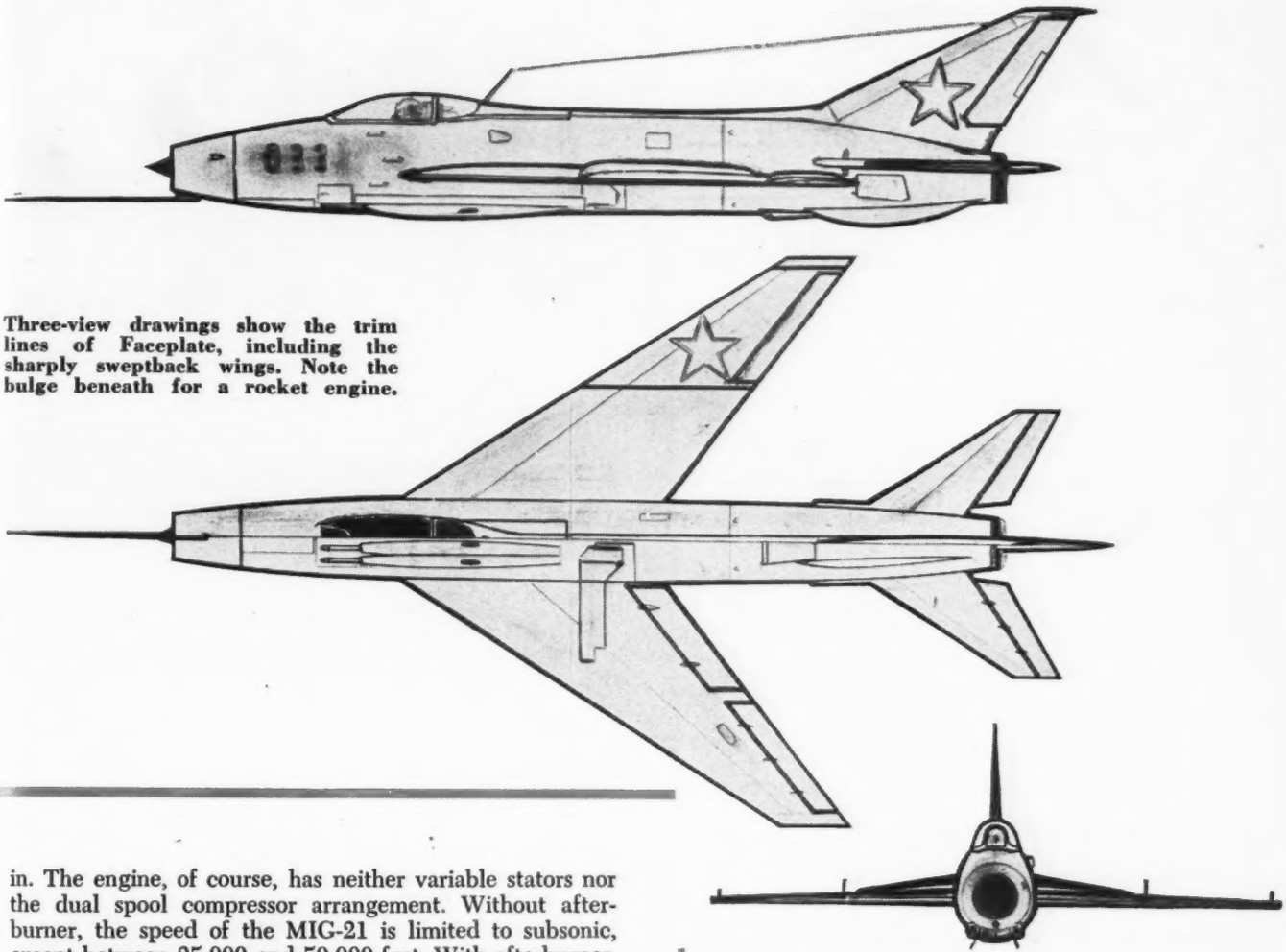

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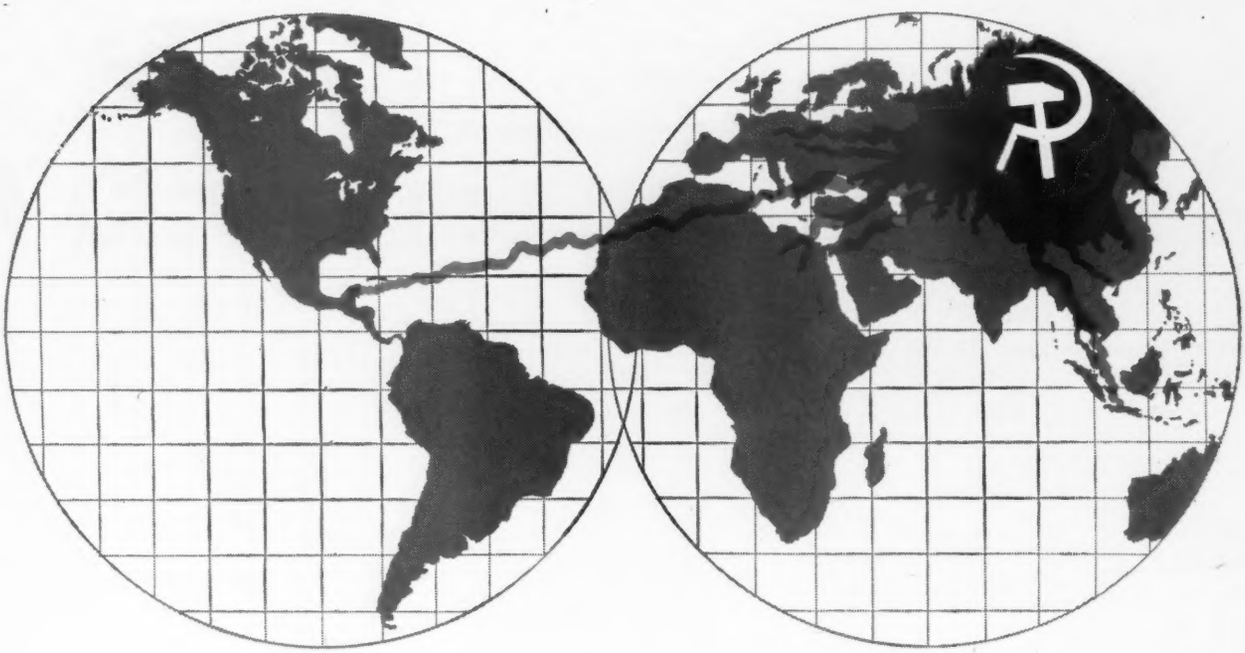

The Kremlin octopus: Since World War II it has reached out, created worldwide crises in accelerating sequence.

An expert's suggestions toward a "policy system" meeting the challenge of . . .

THE PROTRACTED CONFLICT

Robert Strausz-Hupe

THE democratic peoples of the West view peace as the norm of international relations and conflict as an aberration from the normal state of things. This preconception—one great illusion of democracy—has been the most effective ally of totalitarian aggressors who have turned this century into the bloodiest epoch of human history. The aggressors have made one concession to the ideal of democracy: Bent upon conflict, they have avowed their love for peace.

It was easily predictable that the Communists, once the American atomic monopoly was broken, would step up the pace of the cold war while professing all the more ardently their desire to end it. Indeed, the pattern of Communist strategy now is plain: the creation, in accelerating sequence, of international crises accompanied by ever more pressing demands for a "relaxation of international tensions."

The Communists know that the democratic peoples are weary of the cold war. They gamble on the assumption —a plausible one in the light of history—that the democracies will, sooner or later, content themselves with a settlement that promises them "peace in our time" and will not look too closely at the real terms of the compact that relieves them of their fears. At best, such a settlement will be a truce; at worst, if could so weaken the Western democracies' will to resist that it would be tantamount to a decisive victory for Communism. It will not—and it cannot—terminate the cold war, for Communism and conflict are synonyms. Communist doctrine is conflict doctrine.

Our generation, the great democratic illusion notwithstanding, faces the prospect of a prolonged contest with international Communism. The first step toward the development of an effective free world counteraction is a clear understanding of the nature of the enemy who is determined to overwhelm us, and of the strategy he employs toward this end.

We are confronted by an unprecedented paradox: virtually unlimited resources and higher standards of living are within our reach. Yet, the survival of civilization itself has been put in jeopardy. Since World War I our world has undergone continuous revolutionary change. Nationalism, population pressure, and the "revolution of rising

(Continued on page 59)

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RADIOPLANE RP-77D SETS NEW DRONE ALTITUDE MARK!

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expectations" are the chief agents of this revolutionary upheaval. A new order is in the making. The question that now faces mankind is this: Will the new world be free or will it be slave? The future will be decided by the outcome of the conflict between the United States and the Soviet Union, or, more broadly, between the free world and the Communist bloc.

The contest between our way of life and that represented by Communist totalitarianism has been called the cold war. A more accurate description for this struggle might be the "protracted conflict." Protracted conflict is a recognizable historical phenomenon. It accompanies all periods of epochal change.

Revolutionary movements, by their very nature, start from a position of physical inferiorty vis-à-vis the defender of the status quo. The strategy of protracted conflict aims to enable the revolutionary side to wear the enemy down while building up its own strength and to postpone a decisive showdown until the balance of power has shifted overwhelmingly to its side. In essence, this has been the strategy of the Russian and Chinese Communists.

Over the past four decades, the Communists have employed the strategy of protracted conflict to strengthen gradually their position in relation to the capitalist nations of the West. The Communists have matched the material and technological superiority of the West with their own deeper understanding of the nature of conflict in this revolutionary world. They have succeeded in shifting the ratio of power between the two sides to one that almost favors them. Within these four decades, Communist power has grown until it controls the destinies of nearly a billion people. The West has experienced a corresponding decline in the power it once exercised in Asia and Africa.

The salient characteristics of the Communist doctrine of protracted conflict are: (1) the total objective of eventual world domination; (2) the constant shifting of the battleground, instruments, and tactics for the purpose of confusing the West, keeping it off balance, and wearing down its resistance.

The Reds' protracted conflict plans prescribe a strategy for compressing the West over a period of time by limited operations, feints and maneuvers, psychological and economic warfare, and diverse forms of violence. In Communist theory the various techniques of political warfare and selective forms of violence range all of the way from the clandestine distribution of subversive literature to the knockout blow delivered with every available weapon.

Plans for protracted conflict include every possible relationship between peoples and groups, not only military, political, economic, and cultural, but also others that in the West's prevailing liberal philosophies seem the exact opposite of conflict.

This comprehensiveness of view has permitted the Communists to integrate the nuclear bomb into their strategy. In contrast, the West—psychologically incapable of bridging the dialectic gap between peace and war and between one form of conflict and another—failed to exploit the incalculable advantage it enjoyed when it had an atomic monopoly and later when its weapon systems were more sophisticated and differentiated than those of the Soviets.

The Communists are confident that they have developed a military strategy that can defeat the West in any kind of war, although they prefer to obtain their ends short of nuclear war. The Communists have accepted atomic weapons, including the H-bomb, as an integral part of both military and political technology. They have an over-all objective—the communization of the globe—and in pursuit of that objective any and all kinds of weapons may have to be used.

But, unlike the democracies who so exuberantly embrace total war whenever their own vacillation and the overreaching arrogance of the aggressor have pushed them into war, the Communists are guided by an old rule of warfare: economy of force. They propose to use force in carefully measured dosages, no bigger and no smaller than attainment of the political objective requires. Like yesteryear's "colonialists" and "imperialists," whom they denounce and from whom they have learned so much, they would like to complete conquest of the globe without destroying the productive capacity of the conquered, for they hope to harness the resources of the conquered as quickly and completely as possible to their own economy.

They have convinced themselves, however, that if in the process some crockery has to be broken, it might as well be broken atomically, and that a vigorous social system like theirs can survive even thermonuclear punishment, whereas the "rotten" capitalistic system cannot. To this extent, Soviet strategy is "positive" and "constructive," for it implements a political doctrine that envisages creation of a new global order.

But Western strategic thought is defensive. It does not propose to wrest the lands under Communism from their rulers. It considers its weapon systems, including the nuclear, as the means for retaliation against attack, not the instruments of a policy designed to bring about a fundamental change in the status quo.

The Communists apply the strategy of protracted conflict to all aspects of international relations. Thus, the word "negotiation" has a meaning for the Communists which is difficult to reconcile with our understanding of it. A genuine global settlement of differences with the "capitalist camp" is inconceivable to the Communists, but this does not rule out negotiations. Negotiation on any level, from the "summit" on down, is a tactical maneuver by which the Communists improve their position in order to launch new attacks. This is not an argument against any negotiations with Soviet Russia. There is, in theory at least, no reason why the West could not "outnegotiate" Russia. If, however, we expect such negotiations to result in a lasting, all-around settlement of the basic issues of peace and war, then we are heading into a baited trap set by the Communists.

Soviet leaders pay lip service to the "relaxation of tensions." But they decided long ago that permanent, genuine coexistence between their system and ours is impossible.

To be sure, the Communists would like to gain their ends without resorting to total war. But the avoidance of all-out military conflict is not peace; in fact, we are at war in a sense right now. We can suffer a conclusive defeat even though nuclear warheads may never be fired.

The Soviets have always been loath to engage in military conflict unless they were certain of victory. They blundered in Korea, where a clear-cut case of Communist aggression was met by vigorous Western counteraction. The Communists are not likely to repeat this mistake. They now refrain from presenting gross overt challenges that might provoke a strong and united response from the free world.

One of the Communists' favorite methods of waging the protracted conflict is by use of proxies. These come in a variety of packages. The Soviets hid behind the North Korean Army and Red Chinese volunteers in the battle for Korea; they encouraged Nasser's Egypt to drive Western influence from the Arab world.

(Continued on following page)

The Communists strive to keep the West on the defensive and in a reactive frame of mind. They manage this trick by shifting constantly the locale of world crisis. Temporarily stymied by American firmness in the Quemoy crisis, they have attempted to regain the initiative in Europe by heating up the Berlin situation.

Whenever the West appears ready to bring superior power to bear in any situation, the Communists beat a tactical and face-saving retreat—and probe another sector of our defense. In order to divert our attention from the most likely next objective, the Communists resort to what they obviously consider ruses: truce talks, summit conferences, disarmament negotiations, and "about-face" propaganda offensives.

The Communists have been remarkably successful in

How to meet widespread "Communist challenge": with "host of policies, economic, political, intellectual, social, as well as military. . . ."

imposing ground rules for protracted conflict upon the free world. One of these ground rules is the division of the world into two zones: the non-Communist world constitutes the "war zone," in which the Communists are permitted as a matter of course to cause trouble; the West, on the other hand, must not under any circumstances intervene in the "peace zone," namely, the territory controlled by the Communists. Thus, for example, the free world was warned not to "interfere" in Hungary at the time of the rising of the freedom fighters. Yet the Soviets meddle all the way from Iraq to Guatemala.

The Communists contend that the West, in the interests of "peace," must be willing to accept compromise settlements whenever the Communists press their offensive into the "war zone." At the same time, they threaten that the slightest trespass of the Communist frontier will unleash nuclear war.

Communist gains since World War II—the conquest of Eastern Europe and mainland China and the ejection of the West from one "position of strength" after another—attest to the success of Communist strategy and the inadequacy of our policies. Although many policies developed in Washington have been both imaginative and constructive, the American posture over-all has suffered from serious shortcomings. Nearly every policy has been merely improvised in response to the Communist threat. We do not seem to conceive of the conflict with Communism as an integrated whole.

We lack such a strategy of conflict, chiefly, because we are what we are. Although the great majority of Americans are agreed that Communism is an evil, they are divided—as they are on almost all major national issues—on what to think and what to do about Communism and its threat to the American way of life. Neither our people nor our government, nor for that matter the free world in general, have agreed on the basic nature of the Communist threat.

Thus we cannot agree on a common plan for meeting it. The West has neither an agreed political objective nor a clear notion of the nature of protracted conflict. It lacks a doctrine for coping with the Communist challenge. It has not been able either to integrate nuclear weapons into its strategy effectively or make full use of the political leverage afforded by either nuclear or "conventional" capabilities. The West abhors war, seeks to prevent it, and, if it cannot be prevented, "limit" it. All-out war is the final, the unspeakable alternative when all else has failed.

For the Communists, war is just one mode of protracted conflict, and the objective determines the scope of military violence or of any other technique of conflict. Atomic weapons, including thermonuclear bombs, are integral parts of the Soviet conflict machine, preferably to be used as psychological and diplomatic instruments, but ready to be used, if need be, as firepower. The Communists are as aware as we are that they will suffer terrible losses in a thermonuclear duel. But they do not surrender to the "conventional obsession." They know nuclear weapons of all sizes are here to stay, and wishing will not put them back into Pandora's box.

How, then, should we meet this across-the-board Communist challenge to our very existence? The answer, first, is that our protracted-conflict arsenal must contain a host of policies, economic, political, intellectual, social, as well as military, to turn aside the Communist thrust—and deliver thrusts of our own—all along the line.

Within this broad policy concept, two absolute axioms to govern our behavior may be set down. These are the twin guardians of our future.

First, the keystone of our "policy system" is military strength, for the simple reason that without it we are not likely to get a full opportunity to bring the others into play. This may seem self-evident, but it requires emphasis.

Second, we must be positive in our outlook, in our prosecution of policies. If we remain solely reactive, if we always act "second," this is exactly the position we may come to assume on the world stage.

To take a slightly longer look at urgent military questions. . . .

Perhaps nothing is more revealing of the West's perilously defensive, negative approach than the widely publicized and earnestly debated proposals for denuclearization of Central Europe and limitation of its local armaments to "conventional" weapons. According to these proposals, the West's massive atomic retaliatory power—mostly American—is expected to keep on deterring the Soviets from using theirs. Local forces armed with "conventional" weapons—as, for example, the military forces of a "neutralized" Germany as envisaged by the advocates of "disengagement" in Europe—will have the task of coping with peripheral challenges, such as border raids by the Communists or their proxies, revolts engineered by Communists in friendly countries, and other "nibbling" tactics.

But there is not the slightest indication that the West is prepared to bear the financial burden of a strategy based on maintaining both a separate "conventional" military establishment and a nuclear "grand deterrent." This would probably mean doubling the defense budgets of the Western powers. Obviously the nuclear component of Western strategy would have to be maintained at the present rate, for its deterrent power in being would have to furnish the umbrella for the conventional forces. At the same time the West's "conventional" forces would have

(Continued on page 63)

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to be about as large. In short, the West would have to return to the concept of large standing ground armies that prevailed before the second world war. There is no indication that politicians and/or the public would support such a policy anywhere in the West.

The idea that local "conventional" forces can persuade the Communists to desist from starting small wars for fear of landing in unprofitable stalemates or of "tripping off" a nuclear holocaust is based on the assumption that the Reds would and could confine their operations to "conventional" weapons. Now, in fact, nuclear weapons are already an integral part of the Communists' war machine, and it is highly unlikely that they could fight a "limited" war of, say, the dimensions of the Korean War without the use of tactical nuclear weapons even if they wanted to.

It is true that they maintain large standing forces that are not equipped with nuclear weapons. But the principal mission of such forces is to keep down rebellious peoples in the satellite countries and at home rather than to fight foreign wars. The Soviet forces trained for war against the West are schooled in the use of nuclear weapons. They would use them as the tactical situation demanded.

Nuclear weapons are an integral part of Communist protracted conflict strategy. Increasingly the Soviets use their nuclear striking power as a means to condition the West to the acceptance of such ultimatums as, for example, Communist demands for the evacuation of first Quemoy and Matsu and then Berlin.

Yet the Communists, masters of psychological warfare that they are, recognize the limits to their diplomacy of nuclear blackmail. This was demonstrated on the beaches of Lebanon. In the teeth of menacing Soviet gestures, the Sixth Fleet steamed into the Eastern Mediterranean, and United States Marines swarmed ashore at Beirut. They did not encounter Soviet "volunteers." The Soviets did not follow up impetuous pronouncements; they confined their military operations to troop maneuvers north of the Caucasus.

The decisive factor was the United States' capability of massive retaliation. The Soviets were not prepared to test their particular brand of brinkmanship on this particular demonstration of American brinkmanship. The United States was able to make its local intervention stick because its very real threat of massive retaliation impressed upon the Soviets the wisdom of nonintervention. In the light of the United States' outright defiance of Soviet nuclear blackmail it is highly unlikely that the Soviets would have intervened had the United States cared to extend its intervention from the Lebanon to Iraq. But this is another, a political, story.

The West must possess the capability of withstanding psychologically the Soviet nuclear threat and countering it with a superior capability of massive retaliation. This capability in turn must be based on the security of the launching sites of massive retaliation (i.e., their invulnerability to surprise attack) and on adequate military as well as civilian air defense.

The conditions of a viable Western strategy are psychological readiness and military technological superiority, the resolution to stand up to the Soviet thermonuclear threat and the force to counter it. Given the wide spectrum of Soviet challenges, the United States must have the capability of intervening quickly and impressively, as it did in Lebanon, in "limited" conflict situations. If United States intervention in Lebanon and British intervention in Jordan proved anything, it proved that military intervention in a "limited" conflict is not necessarily fraught with the danger of general war. It is the capability of massive strategic retaliation and the resolution to launch it as a last resort which make United States "limited" intervention feasible and narrow the Soviet choice of conflict techniques.

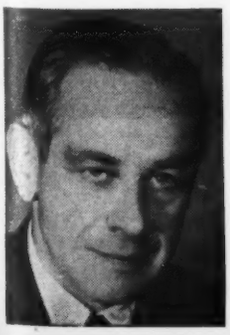
War is an organic whole, and only within this organic whole can any specific action be conceived of as "limited." The West is in mortal danger because, on the one hand, it cannot grasp intellectually the full variety of Communist conflict techniques and, on the other hand, it harbors the illusion that the unlimited aspirations of the Communists can be defeated cheaply, by maintenance of second-best military forces and unilateral declarations of peaceable intentions.

The struggle with Communism is an all-out struggle. At its core is the military-technological race, a race both immensely expensive and terribly risky.

We are given to understand, on the highest authority, that the conflict will continue until the "shrimps have learned to whistle"—until Communists have ceased to be Communists. Until then the West must keep on increasing the power of the "great deterrent" and evolve, under its shield, political and psychological strategies for countering and confounding the Communists.

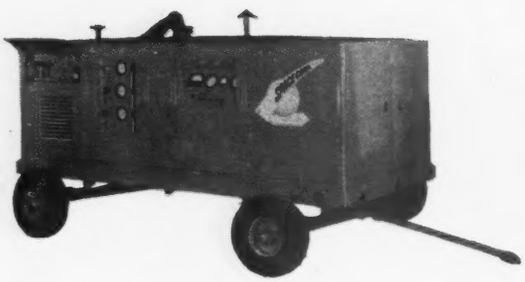
History has cast the United States in the unenviable role of leader of the free world and its principal defender against the Communist bid for world domination. Little in history has prepared the American people for a protracted conflict of unpredictable length and indeterminate outcome. Americans like to think of other peoples as friendly neighbors. They find it difficult to grasp the mentality of the Communists for whom conflict is a way of life and the extermination of the opponent, the ultimate objective.

However, to defeat the enemy we must first know him. Americans must understand the nature and workings of the strategy of protracted conflict before they can hope to meet the challenge of Communist imperialism and turn it back.—END



The author, political science professor Robert Strausz-Hupe, is particularly qualified to write on this subject. His ninth book, written with three co-authors, appears next month. Its title: A Study of Protracted Conflict. *Strausz-Hupe is director of the University of Pennsylvania's Foreign Policy Research Institute and chairman of its International Relations Group Committee. A lieutenant colonel in the Army Reserve, he has lectured at the Air War College, Army War College, National War College, and the Armed Forces Staff College. His published works cover a broad range of national and international issues, including American-Asian relations, the world balance of power, and colonialism. A frequent contributor to magazines, Strausz-Hupe has written for* The Saturday Evening Post, U.S. News & World Report, Fortune, The Reporter, The Air University Quarterly Review, U.S. Naval Institute Proceedings, *and others. Born in Vienna, Austria, in 1903, he joined the faculty of the University of Pennsylvania in 1940, earned his doctorate six years later, was a consultant to the United Nations from 1948 to 1951.*

THE SCOPE OF SPACE



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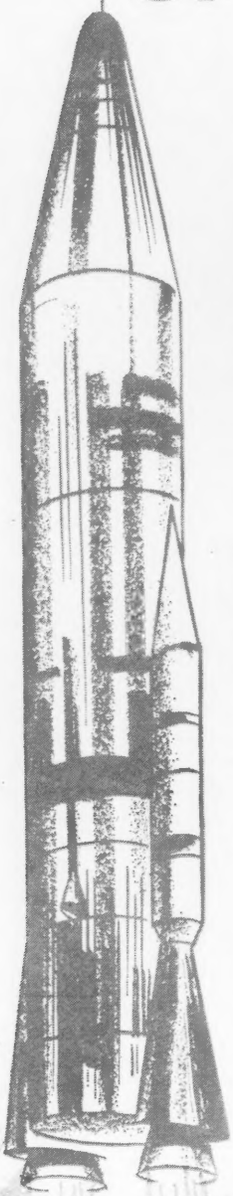
SPACE's entry into the commercial field is marked by the revolutionary new fire and rescue equipment pictured above. Simulated aircraft fires using 500 gallons of JP-naphtha mixture have been extinguished in seconds.



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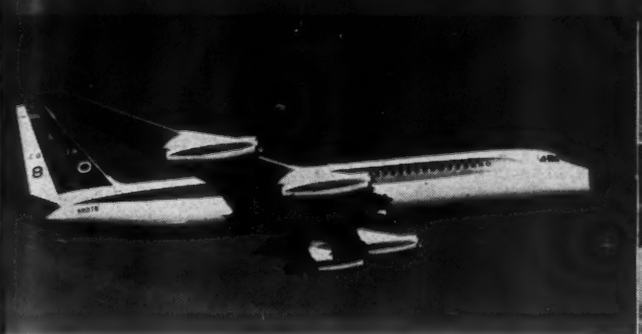
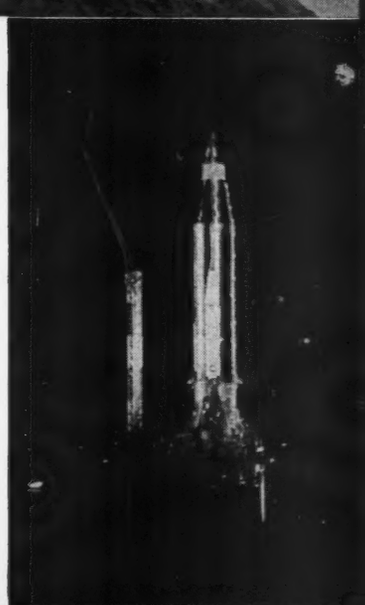
WORLD CONGRESS OF FLIGHT

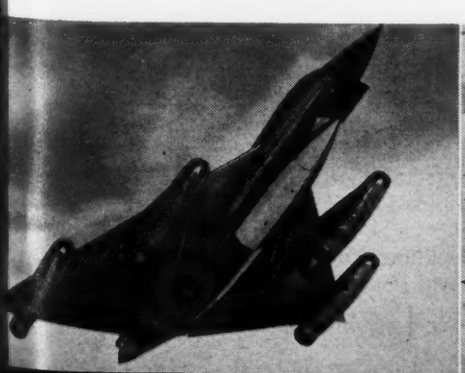


THE world of flight stretches from a seven-cent postage stamp to infinity. It includes tiny electronic devices, ninety-foot-high ballistic missiles, and a farmer who buys a single-engine airplane to fly on Sundays.

Thousands of leaders of this vast world—and the hardware they design, make, service, operate, regulate, study, write about, and dream of—gather this month in Las Vegas, Nev., at the southwestern edge of the sun-baked flatland known as the Great American Desert. They will include representatives of some fifty countries, government officials, and participants from the Army, Navy, and Air Force.

The occasion will be the first World Congress of Flight, which runs from April 12 to 19. The World Congress defies





any single definition. It is not just an international air show, a giant industrial showcase, a convention, a series of meetings, an exhibit, or a demonstration of national wares or strength—the list could go on and on. It is, in fact, *all* these and many more, all adding up to the most comprehensive aerospace effort of its kind ever undertaken.

The World Congress includes eleven major conferences, three major aerial demonstrations, and the largest static display of flight vehicles and related equipment ever assembled in one area. Problems and progress in all phases of flight are on the collective agenda.

The list of high-level participants includes His Royal Highness, the Prince of the Netherlands; The Honorable Walter Binaghi of Argentina, president of the council of the International Civil Aviation Organization; Sir William Hildred of Great Britain, director general of the International Air Transport Association; and Dr. Detlev Bronk of the US, president of the National Academy of Sciences.

Highlights of the World Congress will be televised coast-to-coast over the National Broadcasting Company on Sunday afternoon, April 19, from 5:00 to 6:00 p.m., EST. The planned video program illustrates the scope of the flight world's great gathering. The program, called "The World Congress of Flight—A Special Report," will be narrated by Bob Considine—noted author and news commentator.

The television presentation, bringing an estimated 40,000,000 of the viewing public to the World Congress, will actually come as the Congress moves toward its close for those assembled at Las Vegas for an historic week in the world of flight. The WCF is open to the public on its last two days, April 18 and 19.

The World Congress' aims will be many—thousands of persons, hundreds of organizations, most nations of the free world are involved. But, in essence, the aims boil down to this:

The participants will take part in a general stocktaking, an inventory of where the aviation world stands in numerous fields and where it wants to go. The widely inclusive who's-who nature of the attendance roster will make this as natural as passing the time of day. The vast collection of aircraft, rockets, missiles, and all manner of equipment will provide both a backdrop for discussions along these lines and a thorough orientation course for all hands in what the other guys are doing.

Officials present will be able as never before to exchange viewpoints and information with opposite numbers in all areas of flight gathered together in one place at one time.

The World Congress will be the first international exposition of its kind ever held in this country.

The desire for an international gathering of aviation in the United States has been discussed within the aviation family for years. Many have pointed out that it is proper for America, the cradle of aviation, to stage such an event. The World Congress thus came into being, fathered by the leading figures of the aviation world.

The Air Force Association and six other nonprofit organizations cooperating with it to stage the World Congress scheduled it for April of this year in view of a number of elements:

- Inauguration of the first full year of commercial jet transportation on a global scale.
- The first appearance of America's full jet fleet—including the first public exhibition of Convair's 880 jetliner, and the first major display of the Douglas DC-8.
- World trade interest is at a new high. Russian Premier Nikita Khrushchev has declared "economic war" on the United States "in the peaceful field of trade." International activity is booming within American and other free world industry. And now the advent of the commercial jet on world travel routes promises to revolutionize our whole approach to world trade as well as aviation itself.
- A wish to mark Pan American Week both as a salute to our neighbors to the south and in terms of aviation progress in that region. Pan American Day, April 14, will be commemorated at the World Congress of Flight with special ceremonies and an address by Walter Binaghi of Argentina, president of the Council of the International Civil Aviation Organization, a United Nations specialized agency and the top governmental aviation group in the world. Latin America exemplifies the dramatic progress from ox cart to the air age that has taken place in many parts of the world.
- The tenth anniversary of the North Atlantic Treaty Organization also falls in April. It will be celebrated at the World Congress with aerial demonstrations by pilots from NATO countries plus US aerobatic teams including the Air Force's Thunderbirds and the Navy's Blue Angels. There will also be a NATO anniversary banquet that night as the major ceremonial dinner of the World Congress.
- Nowhere are there more pressing questions than in the field of space. The World Congress coincides with new action within the threshold of the space age; by mid-April 1959, there will have been enough time for thorough consideration in many quarters of factors involved. Scientists will also have had an opportunity to complete preliminary evaluation of data gathered in this connection during the International Geophysical Year. The close of the IGY itself, with an end or diminution of international sanctions for space experiments, opened new problems in the fields of space sovereignty and space law. And the military side of space cannot, of course, be overlooked in the present state of world affairs.

This fact is apparent: Our flight world, having spread its wings more than ever in recent years, is at a crossroads of its own within the larger political-economic crossroads with which the entire world is faced. The World Congress takes place at this crossroads. Other reasons in the realm of sentiment, as noted above, helped dictate the choice of time for the World Congress.

This is the background against which a vast segment of the world of flight will rendezvous in Las Vegas this month. Now, for a closer look at the *dramatis personae* of the World Congress, what they'll be doing, and where they'll be doing it—

The six nonprofit organizations cooperating with AFA as the cooperating agencies of the World Congress of Flight are the Air Transport Association, the National Business Aircraft Association, the National Aeronautic Association, the Electronic Industries Association, the Flight Safety Foundation, and the Space Education Foundation.

The Space Education Foundation was founded two years ago by the Air Force Association with broad pur-

poses in the field of aerospace education and progress, to "receive contributions and other forms of revenue, and to make disbursements from the funds so received, for worthy educational, scientific, literary, and charitable purposes" in the field.

The Foundation, still in its infancy, has pursued these general aims in a number of ways.

One of its most moving activities has concerned widows and children left behind when brave men die pushing back the frontiers of space. Capt. Milburn G. Apt, USAF, was one of these men. He lost his life on September 27, 1956, it will be remembered, after attaining the fantastic speed of more than 2,100 miles an hour in the Bell X-2 rocket research plane. The Foundation is overseeing expenditure of a sum contributed by Bell Aircraft for the education of Captain Apt's two small daughters.

The Foundation is studying a plan at the moment to set up a regular fund to meet educational and other needs that may arise after test pilot accidents.

Another typical Space Education Foundation activity is the International Conference on Space Age Education at the World Congress, which it is cosponsoring with the Fédération Aéronautique Internationale, US Office of Education, University Aviation Association, and the Link Foundation. Leading educators from twenty countries and school officials from across this country will explore the crucial topic of space-age education.

The Foundation conducts continuing efforts in this direction from the local level on up. The breadth of its governing board of trustees is an indication of the breadth of its interests and activities. Included on its board are a Harvard law professor, the head of a medical research foundation, the military analyst of a weekly news magazine, aviation executives, one of the world's leading authorities on space law, a famed nuclear physicist, a bank president, a hotel vice president, and others in equally varied positions. Chairman of the board is Gill Robb Wilson, publisher of *Flying* Magazine and a former president of AFA.

The other five cooperating agencies are introduced in profiles on the succeeding pages. Each has a featured part to play on the slate of World Congress events:

ATA: Chairmanship of the Second Session, Jet Age Conference, by President Stuart G. Tipton; chief pilots' meeting; Airline Operations Conference in Los Angeles immediately preceding the WCF.

EIA: Chairmanship of the Missile Management Conference by President David Hull; sponsorship of Technical Symposium on Aircraft and Space Communications.

FSF: Sponsorship of International Flight Safety Symposium, and cosponsorship of the Flight Safety Symposium for Private Pilots; information center.

NAA: Coordination of attendance by representatives of Fédération Aéronautique Internationale from some twenty countries; major exhibits by component groups; board meeting at Las Vegas.

NBAA: Sponsorship of symposium on Advanced Air Traffic Control and Navigational Aids Concepts.

At this writing, with the number likely to rise by curtain time in Las Vegas, there were also thirty-four "participating agencies"—organizations actively represented at the WCF, holdings meetings there and/or taking part in the program. These also are introduced on pages 78, 79, and 80.

Five of these participating agencies, in addition to the cooperating Flight Safety Foundation, will run information centers in the World Congress of Flight exhibition hall. They are the USAF Air Materiel Command and Air Research and Development Command, the Business and Defense Services Administration, the Federal Aviation Agency, and the Small Business Administration.

These will be manned by key personnel within the organizations prepared to spell out procurement policies, requirements, programs, and other essential information.

There will be, besides, more than 150 exhibitors at the World Congress covering the spectrum of aviation, space, and allied fields.

Some forty of these exhibitors are slated to present, in addition to their displays, special briefings on their operations presided over by top executives. These will lay before the aerospace world the personally presented story of each firm's operations, concepts, products, and services.

Concerns that had listed such briefings included: Avion Division, ACF Industries, Inc.; Aerojet-General Corporation; Burton Manufacturing Company; Canadair Ltd.; Delco Radio Division, General Motors Corporation; Electronic Specialty Company; Fletcher Aviation Corporation; AC Spark Plug Division, General Motors Corporation; Hallamore Electronics Company; Hycon Manufacturing Company; Itek Corporation; Lawter Chemicals, Inc.; Lear, Inc.; Lockheed Aircraft Corporation; Lytle Engineering & Manufacturing Company; Marman Division, Aeroquip Corporation; McCormick Selph Associates; and Mill Polishing Corporation.

Also Minnesota Mining & Manufacturing Company; Motorola, Inc.; Narda Ultrasonics Corporation; National Vulcanized Fibre Company; Northrop Corporation; Nova-Tech, Inc.; Permanent Filter Corporation; Pratt & Whitney Aircraft Division, United Aircraft Corporation; Radiant Color Company; Riverside, Calif., County Airport Commission; Rosan, Inc; Sylvania Electric Products, Inc.; Space Corporation; Space Electronics Corporation; Statham Instruments, Inc.; Teco, Inc.; Victor Equipment Company; Waldale Research Company, Inc.; Wayne Manufacturing Company; Western Air Lines, Inc.; Wollensak Optical Company.

Seventy-seven nations were invited to send representatives to the WCF. A letter of transmittal from Secretary of State Dulles accompanied the invitations, which were sent by Governor Grant Sawyer of Nevada. Advance registration has indicated that at least fifty nations will be represented, many with their ambassadors, air attaches, or chiefs of air staff to be on hand.

The symposia and conferences will explore flight in terms of international security and welfare; analyze social, political, moral, and economic problems; and present flight in its broadest concept as an instrument of mankind, at the same time dealing with practical and technical problems.

Las Vegas was selected for its unique facilities, its excellent all-year round flying weather. It offers a vast new exhibit hall, an outdoor stadium, adequate hotel accommodations, conference facilities, McCarran Field for civil aeronautics events, Nellis AFB for military demonstrations —a combination well suited to the grand design of the first World Congress of Flight.

—Frederic M. Philips

A WORLD CONGRESS OF

The Air Transport A

THE Air Transport Association of America is a cooperative nonprofit organization, composed of United States and Canadian airlines certified by the Civil Aeronautics Board for scheduled service over regularly established routes. The Association was founded nearly a quarter-century ago.

The activities of the ATA range from the field of aviation safety to the study of legislation; from economic surveys to analyses of operating costs; from improving schedule reliability to the full promotion of air transportation before the public.

Its original membership of twelve airlines has grown to forty-nine, of which thirty-nine operate in and from the United States. Two member outfits have headquarters in Canada, one member operates in the West Indies, five in Alaska, one in Latin America, and one in Hawaii. ATA's field covers the transportation of passengers, property and mail by aircraft.

The Air Transport Association stepped into the aviation picture in January 1936 to meet the young air transport industry's need for the coordinating and stimulating force of a central pool of technical and operational knowledge, experience, ideas, and strength. ATA has been first and last a service organization. It makes possible not only the pooling of the technical and operational knowledge of its members but also much of their "know-how" born of millions of miles of flying.

The Association uses two approaches in serving members. First, there are conferences or committees in each major field composed of airline executives, who thus combine their experience. Second, there are traffic and sales, engineering, economic, business, public relations, and other experts employed directly by the Association, both at its headquarters in Washington and its four regional offices in the field.

The Operations and Engineering Department of the Air Transport Association serves the Operations Conference and the Engineering and Maintenance Conference of the Association. These bodies are composed of airline executives who meet regularly to consider the solution of operational and technical problems, both in the air and on the ground.

One of the major functions of the Department is continuous contact and consultation with the Federal Aviation Agency and the Civil Aeronautics Board on such subjects as safety regulations, air traffic control, navigation and landing aids, improvement to approach and airport lighting, and airport development in general. The same link exists with the United States Weather Bureau, the Air Force, the Army, and the Navy, particularly in connection with the development and adoption of all-weather flying systems and devices. Also similar work is done with the International Air Transport Association and the International Civil Aviation Organization.

The department consists of three divisions: the Air Navigation and Traffic Control Division, which concerns itself with the improvement and expansion of the air traffic control system and air navigation aids of all types; the Engineering Division, which is responsible for problems dealing with engineering, maintenance, and purchasing which arise within the industry; and the Operations Division, concerned with the many varied aspects of airline/aircraft operational safety problems, including such major items as domestic and international safety regulations; meteorology as related to scheduled operations; use of airspace by the various air transport groups; noise abatement; and joint use of airports.

Problems of the immediate future in the Air Navigation and Traffic Control Division include operational and technical phases of new navigation and landing aids and the air traffic control requirements which are available within the present state of electronic art. System planning and operational problems are actively dealt with in connection with such aids as the VHF omnirange, surveillance, and precision radar, air traffic control data display and data transfer, and the evaluation looking toward the possible integration of TACAN (Tactical Air Navigation achieved through the use of electronics) into what is called the Common System.

The Common System is based on the recognition that air navigation and control techniques must be designed to accommodate all users of the airspace—both civil and military. Ultimate common system planning efforts include studies of the operational problems posed by increased numbers of aircraft with wider speed ranges, as exemplified by helicopters at one extreme and jet aircraft at the other.

Typical problems handled by the Engineering Division deal with standard design specifications for aircraft, aircraft equipment, and ground-handling equipment; preparation of uniform methods of presentation of performance and cost data to the airlines by the manufacturers; coordination between various professional groups, such as the Society of Automotive Engineers, on questions of standardization; development of means for the protection against and prevention of aircraft fires; the study of procedures to permit the safe transportation of hazardous materials by air; the study of new type aircraft to be utilized by the airlines, including helicopters and other rotorcraft, and the coordination of such studies with air-

OF FLIGHT COOPERATING AGENCY

Association

STUART G. TIPTON
President, ATA

craft and equipment manufacturers and the government; the promotion of aircraft prototypes in general; the study of aircraft accidents and recommendations for corrective measures; and negotiations between the air transport industry and the government on all aspects of both domestic and international airworthiness regulations.

The Operations Division represents the airlines before the other users of airspace, both military and civil, and before government aviation regulatory agencies, as well as before the Weather Bureau. The opinions of the scheduled airlines are thus consolidated toward enhancing the safety and regularity of air-carrier operations.

The Division conducts detailed traffic analyses at key traffic centers, on the basis of which airline schedules are, when necessary, rearranged in the interest of scheduled regularity with maximum safety.

The Traffic Department has among its primary activities the publication and distribution of industry passenger tariffs; the administration of the sales agency program; the administration and coordination of the industry air mail, air parcel post and military advertising and promotional programs, the administration of the Universal Air Travel Plan (sponsored by the Air Traffic Conference and the International Air Transport Association); coordination of the industry-military traffic program and the routing of military movements; the improvement and refinement of reservations procedures; maintenance of complete records of the Conference and its committees; publication and maintenance of the Trade Practice Manual which concerns all Conference Committees: Air Traffic Conference, Advertising Agency, Military Traffic, Reservations, Passenger Tariff, Ticketing and Baggage, and subcommittees as may exist or be created from time to time.

Among the Traffic Department's specialized divisions or sections are the Tariff Division which consolidates, publishes, keeps current, and files with the Civil Aeronautics Board and Air Transport Board of Canada the joint passenger fares tariffs and passenger rules tariffs of ATA member airlines, as well as performs the "paper work" in connection with various industry programs; and the Military Bureau established in 1949 to foster, promote, and develop the use of air transportation by the various agencies of the Department of Defense.

The primary responsibility of the Division of Air Transport Economics is to gather, organize, analyze, and interpret factual material regarding the traffic, finances, and operations of the scheduled airlines, for use in the determination of industry policy. The Division also analyzes trends and relationships between the various forms of transportation, particularly as these are likely to affect airline activities. General economic statistics are also employed in making industry studies.

The Public Affairs Department of the Air Transport Association has the major responsibility of dealing with those problems which affect the air-carrier industry arising at the state and local levels of government.

The Federal Affairs Department of the Air Transport Association was organized in 1957. The Department follows closely all federal legislation and legislative developments which affect air transportation and coordinates federal legislative activities of the airline industry so as to secure adequate representation on matters which are of common interest.

The Finance and Accounting Department serves the Airline Finance and Accounting Conference, a body made up of financial officers of the certificated US airlines. This work is carried on through eleven standing committees: Accounting and Records Committee, Audit Committee, Budget and Cost Control Committee, Insurance Committee, Machine Accounting Committee, Mail Rate Committee, Revenue Accounting Committee, Stores & Material Planning Committee, Taxation Committee, Air Cargo Accounting Subcommittee, and Air Cargo Claims Subcommittee.

The Legal Department works with congressional committees and various government departments and in addition furnishes advice and assistance to the following committees of the ATA and its Conferences: Airport Agreement's Committee, International Committee, Legislative Drafting Committee, Tax Policy Committee, Administrative Procedure Committee, Agency Committee, Air Travel Plan Committee, Reservations Committee, Tariff and Rates Committee, Ticketing and Baggage Committee, Purchasing Committee, Accounts and Records Committee, Insurance Committee, Revenue Accounting Committee, and Taxation Committee.

The Public Relations Service is responsible for providing up-to-date information on all problems affecting its operation. In this connection, the scheduled airlines have approved a public relations program oriented to a basic factual theme: Air transportation is vital to the public it serves.

The Department also answers inquiries and furnishes air transport material upon request to news services, periodicals, and various annual publications.

Top ATA officers include President Stuart G. Tipton and seven vice presidents—Frederic Davis, John Hoving, E. F. Kelly, W. N. Martin, J. L. O'Brien, Leo Seybold, and Robert L. Turner.—END

A WORLD CONGRESS

The Electronic Industries

THE Electronic Industries Association, founded thirty-five years ago, is the only national trade association representing all major manufacturing segments of the vast electronics industry, which began in the early twenties as the radio industry.

The industry, with the Association, has accordingly come a long way. The vital importance of electronics to our national defense and peacetime way of life has never been dramatized more than by the satellite and missile advances of the recent past. The space age is, in reality, also the electronics age.

Half of Output Goes for Defense

EIA was formed when radio broadcasting was just beginning. As the industry has expanded into television, military and industrial electronics, and a variety of new products, the Association has kept pace in its organizational structure and its services. Today, within its five product divisions are manufacturers—large, medium, and small—of practically all categories of electronic equipment and their components.

With more than half of the electronics industry's production capacity devoted to the needs of national defense and space exploration, EIA is geared to serve the interests of its 350 members in these areas as well as in consumer and industrial products. EIA and the electronics industry include some of the major military contractors of these conquerors of time and space.

David R. Hull, vice president of Raytheon Manufacturing Co., is President of the Association. He was elected by a fifty-man board of directors. Mr. Hull serves over five vice presidents, each representing a product division of the Association.

Robert S. Bell, President of Packard Bell Electronics Corp., is the senior vice president and represents the Consumer Products Division. The other vice presidents are Sidney R. Curtis, Stromberg-Carlson Division of General Dynamics Corp., representing the Military Products Division; C. Russell Cox, Andrew Corp., Technical Products Division; Russell E. Cramer, Jr., Radio Condenser Co., the Parts Division; and Arthur L. Chapman, CBS-Hytron, the Tube and Semiconductor Division. These plus Executive Vice President James D. Secrest, General Counsel William L. Reynolds, and Treasurer Leslie F. Muter, of the Muter Co., comprise the officers of the Electronic Industries Association.

During World War II the industry reached an annual production rate of more than $3.5 billion. With the even greater demand for military electronics during the Korean War, the industry's output passed the $5 billion mark. Military spending for electronics alone during 1958 was estimated at $4.1 billion, while the industry's total output reached a record $7.9 billion. An increase to $8.3 billion is expected in 1959, with all segments of the industry showing gains.

The Association as it is known today began as the Radio Manufacturers Association in 1924. In 1950 it added to its name a "T" for television, and in 1953 it inserted an "E" for electronics. In 1957 lt became EIA to further emphasize the all-encompassing structure of the Association.

EIA has now established sections dealing with recent developments in nuclear instrumentation, computing, and data-processing systems. The process of expansion is expected to become ever more sophisticated as new products and techniques are introduced.

EIA's Consumer Products Division provides a vehicle for united action on matters affecting the home entertainment segment of the industry. In recent years major attention has been focused on color TV development, receiver servicing problems, UHF-VHF broadcasting, FM, excise tax matters, and safety standards.

The Association's Technical Products Division covers a wide variety of commercial electronic products, including quartz crystals, radar, communications, broadcast and studio equipment, and computing and data-processing equipment.

Parts Division Is EIA's Largest

Member concerns of the Parts Division exceed in number and variety those of any other EIA division. Each manufactures parts that go into electronic apparatus of all types—entertainment, industrial, military. The division comprises more than a score of product sections and provides a meeting ground for management representatives of firms making capacitors, resistors, coils, wire, switches, tuners, antennas, phonograph parts, speakers, test and panel instruments, and related equipment.

The Tube and Semiconductor Division, smallest major product group within EIA, historically has concerned itself with radio receivers and TV picture tubes. More recently, however, it has expanded as a result of commercial developments in the field of solid state devices—transistors, diodes, and rectifiers.

Postwar developments in weaponry persuaded EIA to form a new division in 1956 to devote full attention to the growing military electronics business. Today, though the youngest of EIA's five divisions, the Military Products

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DAVID R. HULL
President, EIA

Division is one of the largest and most effective industry groups in the organization.

Unlike other EIA divisions, it was organized along functional rather than specific product lines to meet the problems encountered by military electronic contractors. Functional committees were established to study and act upon military electronics problems and provide liaison between the military services and the industry.

The broadest of these functional committees is the military systems management committee. The group is currently examining the effect of the weapon system concept on the electronics world—in terms of small business, management efficiency, lead-time, scientific progress, research and development programs, and other areas.

The military spare parts committee, a more specialized group within the division, works closely with the Defense Department and collaborates with the armed services in preparing specifications and directives relating to electronic spare parts, equipment reliability, group-support documentation, and the like.

The Division's prime-sub-supplier relations committee concerns itself with the myriad problems arising from relationships between prime contractors, subcontractors, and their suppliers. At the request of the government's Small Business Administration, the committee presently is investigating the feasibility of drafting model contract clauses for use in subcontracts as a time-saving device eliminating complex and detailed forms.

Activities of Military Products Division

The Military Products Division engages in nationwide procurement conferences, seminars to spell out Pentagon proposals and concepts for industry, and "field trips" to provide management the opportunity of exchanging ideas with military personnel directly responsible for product operation and maintenance.

The Military Products Division acts continuingly as a channel of communication between industry and the armed services, circulating information to industry concerning policy, military directives, revised specifications of a broad nature, and proposals for bids on electronics projects. Instances of the latter included the Air Force Weather Observing and Forecasting System (433L), the AIRCOM (480L), and STRATCOM (456L).

Capt. Henry E. Bernstein, USN (Ret.), serves as EIA's military engineering coordinator. He provides liaison between the policy-making committees of the division and the technical engineering committees of the Association's Engineering Department. He also acts as the major Pentagon-EIA go-between on matters of military engineering.

EIA's versatility has been demonstrated time and again during its thirty-five-year history. Its activities are not confined to a single segment of the electronics industry.

Television as we know it today would not have been possible had it not been for EIA's two national television committees. These groups, through pooling the research and development of the entire industry, developed black and white and color TV transmission standards. Similarly, the recently established stereophonic radio committee of EIA is working in this field to lay the foundation for standards in this new, increasingly popular area of home entertainment.

Hundreds of EIA committees work constantly on problems relating to entertainment receivers, military equipment, technical products, receiver components, special quality components, automation equipment and computers, and general electronic devices. The committees are staffed by qualified technical representatives from industry. Their principal function is to propose technical standards subject to industry approval.

EIA's marketing-data department, which collects and disseminates marketing data relating to trends in production, inventories, and sales, provides the industry regularly with some fifty statistical reports. In addition, it conducts special surveys and issues studies of interest to military electronic producers covering governmental expenditures and budgetary trends.

Accepting the Challenge

The five EIA departments, as differentiated from the divisions, include military relations, industrial relations, and international as well as engineering and marketing data. The military relations department provides a vehicle for detailed consideration of military procurement problems and government contracting procedure and a channel through which military electronic suppliers can make their view known to the Defense Department and the military services in an orderly and representative manner.

The industrial relations department provides EIA members with a means of taking cooperative action on industry-wide employer-employee and manpower problems, and the international department serves as a focal point for industry action on matters affecting the ability of EIA members to sell their products abroad.

The ever-increasing importance of electronics in space exploration and national defense as well as in industrial and consumer product fields is evident. The industry is geared to accept this challenge.—END

A WORLD CONGRESS O

The Flight Safety F

THE Flight Safety Foundation is an organization supported by the vast majority of the aviation world to help improve aviation safety.

It is a fourteen-year-old nonprofit, nongovernment, independent organization that attacks the problem of safety on a broad front. In general terms, it seeks to promote optimum standards of safety in aircraft design, manufacture, maintenance, and operation.

The FSF program to attain these ends breaks down into eight subdivisions:

1. Bulletins and special reports providing a worldwide exchange of air safety information.

2. National and international seminars and meetings which provide an exchange of ideas, serve to broaden individual concepts, and acquaint engineers with problems of operators and operators with problems of engineers.

3. Analytical studies such as a medical standards project for aircrew and air-control men conducted for the old Civil Aeronautics Authority and an investigation to find the effects of air pollution on aircraft operations.

4. Anticipating flight safety problems—for instance, the growing problem of midair collision and possible sensory illusions.

5. Encouraging research. The Foundation suggests and encourages research over a wide area which has included in the past such matters as fire suppression, crash locator beacons, and approach light systems.

6. Awards. Annually, FSF presents awards to individuals and companies for distinguished service in behalf of flight safety.

7. Correspondence and personal contacts in response to numerous requests from individuals and companies for specific safety information—data on accidents due to icing (as requested by a European airline captain serving on an accident investigation board abroad), requests for ditching information, and so forth.

8. Education. FSF works with colleges, universities, and training schools in flight safety matters, and members of the staff work individually with various state and national education groups.

Product of 'Enormous Conscience'

A continuing effort is made to anticipate potential safety problems and alert designers, manufacturers, government agencies, and operators regarding the need for specific improvements. When an accident occurs, FSF studies the factors surrounding the mishap and formulates conclusions and recommendations to try to prevent recurrence. These and other findings and recommendations are given wide and essential circulation through distribution of FSF safety bulletins, special reports, contacts, conferences, and seminars.

At its formation in 1945, the Foundation was financed primarily by individuals. Over the years, as the activities of FSF have become more widely known, this support has been augmented by that of the world's airlines, aircraft and equipment manufacturers, oil companies, the banking industry, insurance groups, business aircraft owners and operators, pilots' associations, and other groups.

An interesting factor of the FSF operation was recently described thus by the organization's Managing Director Jerome Lederer:

"One must credit the aviation industry with an enormous conscience for this magnanimity [in supporting FSF], because it is frequently the subject of severe criticism by the Foundation. In supporting our work, the aviation industry knowingly puts on a hair shirt—for its own good.

"For instance, funds from aircraft manufacturers provide the Foundation with the wherewithal to do its work. Yet in its *Design Notes*, the Foundation supplies a continuous stream of criticism based on oversights made by design engineers."

The bulletins do not name names, however, since FSF feels its mission is to "avoid repetition" of dangerous practices or situations, not "fix the blame."

Posters Point the Way

FSF does deal directly with individual airlines and manufacturers, in addition, to clear up matters judged to be "sensitive" on a somewhat more confidential basis than provided by the bulletins.

An example of one facet of the day-to-day FSF safety effort is this partial list of "passenger safety precautions" distributed by the Foundation:

"Before and after each trip passengers must be warned:

"a. Not to use the door as a lever to help them emplane and deplane. Such pressure is likely to spring the door.

"b. To take notice of and avoid the upper lock door catch which is at the inside top center of the door. This catch could cause someone a serious face or eye injury as he emplanes or deplanes.

"c. Passenger must never actuate the door, either to open or close it. Only the crew may do this."

Another is the display of imaginative safety posters seen in hangars and operations shacks. A typical one of these features a small child in a set of long-johns with flap inadvertently down. The child's tail-end configuration protrudes naked. The message? "Be sure all doors and openings are fastened before takeoff."

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Foundation

JEROME LEDERER
Managing Director, FSF

A second poster, very much to the point as time goes on, shows a variety of aircraft—piston, jet, helicopter, fighter, transport—maneuvering in a small amount of airspace. "Look out, you are not alone," the flyer is cautioned.

Further, FSF tries to impress on individual members of the air-ground aviation team the immense responsibilities they carry in the routine line of duty. The Foundation's printed "creeds" for airmen and ground-crewmen are widely distributed. They are also used by the armed forces.

One of them, the "mechanic's creed," goes as follows. It is long but worth printing in full:

The 'Mechanic's Creed'

"Upon my honor I swear that I shall hold in sacred trust the rights and privileges conferred upon me as a certified mechanic. Knowing full well the safety and lives of others are dependent upon my skill and judgment, I shall never knowingly subject others to risks which I would not willingly assume for myself, or for those dear to me.

"In discharging this trust, I pledge myself never to undertake work or approve work which I feel to be beyond the limits of my knowledge; nor shall I allow any noncertificated superior to persuade me to approve aircraft or equipment as airworthy against my better judgment; nor shall I allow my judgment to be influenced by money or other personal gain; nor shall I pass as airworthy equipment about which I am in doubt, either as a result of direct inspection or uncertainty regarding the ability of others who have worked on it to accomplish their work satisfactorily.

"I realize the grave responsibility that is mine as a certified airman to exercise my judgment on the airworthiness of aircraft and equipment. I, therefore, pledge unyielding adherence to these precepts for the advancement of aviation and for the dignity of my vocation."

FSF's annual Air Safety Seminar and similar activities bring together professional people to discuss safety problems in an atmosphere of calm objectivity. Away from the press of daily work and decision making, persons in different aviation fields exchange ideas, gain perspective, broaden their knowledge.

FSF distributes ten regular bulletins. Circulation is just under a million. They are sent worldwide—to home and away bases of US domestic and international air carriers, to the operations offices of non-US carriers, to the flight bases of the armed forces at home and abroad. Many FSF bulletins are reprinted by member firms and given special distribution.

FSF's medical standards and air pollution studies were in wide demand, as was the product of another special investigation on the peddling of what were termed "bogus parts." This concerned manufacture and sale by virtually unknown concerns of inferior substitutes for critical engine and aircraft parts.

The Foundation feels that new aviation developments, including the fact that the jet is coming more and more to rule the sky, present the greatest safety challenges in the history of aviation. It has laid down a special six-point program to meet crucial current problems:

- A jet project to aid in general transition to jet operations, including training and traffic control.
- Work in collision prevention, including aircraft conspicuity, cockpit blind spots, and crew complacency.
- Distribution of safety material from accident investigation records.
- Maintenance of pilot standards to assure public safety.
- Consideration of effects of missiles and space vehicles on safety of conventional operations and radio transmission.
- Effect of increased noise on efficiency and health of ground crews.

Avoiding the Mistakes of the Past

The Foundation has, in addition, set for itself the task of forecasting operational hazards that can be expected in the introduction of VTOL and STOL aircraft. The hope is that the "accident" growing pains which accompanied the early days of conventional planes can be avoided in these cases.

In the field of private and business aviation, which is large in the United States and growing elsewhere, the Flight Safety Foundation is encouraging pilots to learn to fly on instruments to meet inevitable bad weather situations. In airline operations, the Foundation is preparing special publications stressing new demands for air and ground crews.

Four top officers head the FSF staff. They are Adm. John H. Cassady, USN (Ret.), president; Ansel Edward Talbert, vice president; Harper Woodward, chairman of the board and the executive committee; and Managing Director Lederer. Foundation headquarters are in New York.

FSF aims, in the solution of aviation safety problems, to work increasingly with all interested individuals and organizations—governmental, private, and worldwide. If there is any thumb rule for aviation safety, FSF feels, it is this:

"Learn from the mistakes of others; you won't live long enough to make them all yourself."—END

A WORLD CONGRESS O

The National Aeronautic A

THE National Aeronautic Association, successor to the Aero Club of America, is the oldest national nonpartisan, nonprofit, and noncommercial aviation organization in the United States. The Aero Club was formed in 1905, the NAA itself in 1922. It has devoted its energies over the years to the progress and development of all segments of US aviation by providing a link between the public interest and various aviation groups which comprise the country's air leadership.

One of NAA's major objectives in recent years, in conjunction with the Aircraft Industries Association, has been the development and financing of a program to promote the education and training of primary and secondary school teachers in the art and science of aviation. Administration of this program is in the hands of NAA's associate, the National Aviation Education Council (NAEC). Individual and library membership in NAEC has grown from a mere fifty members in 1955 to more than 3,000 now.

Major elements of the NAEC program include encouragement of the study of the airplane, its uses and influences in relation to general aviation; the encouragement of aviation education for teachers, school administrators, and the general public; the encouragement of an understanding of airpower in relation to the national defense and to the peacetime pursuits of society; the development of community leadership in aviation education; the encouragement of travel by air and the use of aviation in business, industry, and agriculture as an adjunct to leisure, relaxation, and cultural pursuits; and the evaluation, publishing, and distribution of educationally suitable materials of instruction in aviation education.

A second major function of the National Aeronautic Association is representation, on behalf of the United States, in the Fédération Aéronautique Internationale. NAA is responsible, in this respect, for (1) the promotion and development of aviation as a powerful instrument for uniting the peoples of the world; (2) the stimulation of general aviation; (3) the facilitation of international air travel by private and business-owned aircraft; and (4) the control and supervision of sanctioned aviation competitions and official air records established by all types of aircraft. During 1958 there were forty-eight new world and world "class" aviation records established in the United States.

Further major functions of NAA include administration of important annual awards which encourage, reward, and publicize high achievement in the advancement of aviation. Awards include the Collier, the Wright Brothers Memorial and the Frank G. Brewer Trophies, and honors for elder statesmen of US aviation.

Specialized divisions and affiliates of NAA that have been authorized by NAA to administer specialized parts of the FAI franchise in the United States include the Academy of Model Aeronautics (AMA), the Soaring Society of America (SSA), the Parachute Club of America (PCA), and the National Pilots Association (NPA).

The Academy of Model Aeronautics, a division of the National Aeronautic Association, has as its major objective the promotion and development of model aviation in America. Specific functions, under the FAI franchise rights granted by NAA to AMA, include the supervision and control of all official model aircraft records conducted in the United States; the promulgation of "special" rules governing competitive model flying; the licensing of model flyers, contest directors, and officials; the supervision and control of sanctioned model competitions conducted in the United States, and the selection of US teams which participate in the world model championships. More than 450 sanctioned model competitions, including the National Model Championships, were held in the United States in 1958.

The National Pilots Association, an affiliate of NAA, is a member-controlled, nonprofit organization for general aviation pilots. It was formed to fill the needs of pilots who take an active personal interest in the problems of general aviation. It functions as a communications belt between its member pilots and the many government agencies that affect general aviation. It provides a forum in which the constructive ideas of its membership can be resolved into policy.

The Soaring Society of America, an affiliate of NAA, has as its broad general objective the promotion and development of motorless flight in the United States. Some of the specific functions included in the FAI franchise rights granted by NAA are the issuance of performance and eligibility licenses; the supervision and control of official sailplane records and sanctioned sailplane competitions conducted in the United States, including the national soaring championships; the award of FAI's sailplane performance badges; and the selection of US teams which participate in the world championships for motorless aircraft.

The Parachute Club of America, an affiliate of NAA, has as its broad general objective the promotion of the sport of parachuting in the United States. This national organization too has been granted FAI franchise rights by NAA to issue qualitative licenses; supervise and control the establishment of official parachuting records and sanctioned parachuting competitions conducted in the United

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THOMAS G. LANPHIER
President, NAA

States; and to select US teams which participate in the world championship parachuting competitions.

Other affiliates of NAA include the Professional Race Pilots Association, interested in the development of special racing airplanes and the promotion of closed-course air racing under controlled safety conditions; the University Aviation Association which promotes aviation education among the teachers and professors at US colleges and universities; and the Air Transport Association of America, another World Congress of Flight cooperating agency.

Current NAA membership, including affiliates and associates, totals more than 35,000 individuals.

NAA's high hope, toward which considerable progress has been made, is a permanent home for itself and its divisions, affiliates, and associates in Washington, D. C., to be known as the National Aviation Center. Such a facility eventually will enable a closer working relationship among aviation organizations and groups interested in aviation and space vehicle progress.

Scheduled by NAA during the World Congress are meetings of its officers and directors and of the astronautics subcommittee of the International Sporting Aviation and the aviation education committee of the Fédération Aéronautique Internationale. These latter two committees include representatives from nineteen nations of the world.

Thomas G. Lanphier, Jr., vice president and assistant to the president of the Convair division of the General Dynamics Corp., is president and chairman of the board of NAA. He is also a past president of the Air Force Association.

First NAA vice president under Lanphier is Miss Jacqueline Cochran, president of the Fédération Aéronautique Internationale.

Mr. Lanphier is scheduled to head the American delegation to this year's general conference of the Fédération Aéronautique Internationale. The meeting will be held in Moscow at the end of May.

Miss Cochran will preside over the FAI parley, the first ever to be held in Russia. Last year's was in Los Angeles; Miss Cochran was elected to the organization's top post at that gathering.

Others in the US delegation will include Frank Pace, president of General Dynamics; NAA director Frederick C. Crawford of Thompson Ramo Wooldridge; and NAA director Capt. John J. Ide, USNR.

Alternates for the Moscow trip are NAA vice president John F. Victory, assistant to National Aeronautics and Space Administrator T. Keith Glennan; NAA vice president Martin Decker of Decker Corp.; NAA national secretary Mrs. Arlene Davis; NAA director George Haddaway, publisher of *Flight* magazine and president of the National Pilot's Association; and NAA director Arthur C. Storz, Jr., an Omaha businessman.

The Russians have announced plans for a reception by government officials, a visit to a civil aircraft factory, an aerial display by the USSR Aero Club, and visits, if desired, to Leningrad and Kiev after the FAI meeting ends.

The full roster of other NAA officers is listed below:

Vice presidents: Maj. Gen. Lucas V. Beau, USAF (Ret.); Comdr. Cook Cleland, USN; Martin Decker; George Gardner; George Haddaway; Roger W. Kahn; Max Kriendler; William P. MacCracken; Sen. Jennings Randolph; Bertrand Rhine; Al Vaughan; Dr. John F. Victory; Ann Wood.

Secretary: Mrs. M. T. (Arlene) Davis; **Treasurer:** Edward C. Sweeney; **Executive Secretary and Asst. Secy-Treas.:** C. S. Logsdon; **General Counsel:** William P. MacCracken.

Board of Directors: Thomas G. Lanphier, Jr., Chairman; E. N. Angus; Mrs. Elma V. Beck; Mrs. O. A. Beech; Clarence Belinn; Kenyon Bolton; Mrs. Mary M. Brown; Willis C. Brown; Dr. Leslie A. Bryan; Frederick C. Crawford; Arthur R. Christie; Miss Jacqueline Cochran; Joe Crane; Lucien DeTar; Fred D. Fagg; Roger C. Fleming; J. T. Geuting, Jr.; Dr. Walter A. Good; George W. Haddaway; E. H. Heinemann; Philip S. Hopkins; Jack Hughes; Capt. John J. Ide, USNR; Rudy C. Mueller; Mrs. Frances W. Noble; William Ong; Elwood R. Quesada; Robert Ramspeck; Ben Regan; Paul A. Schweizer; Arthur C. Storz, Jr.; S. G. Tipton; A. Paul Vance; Col. Alfred M. Waddell, USAF; Gene Waddle; Donald D. Webster; Ralph V. Whitener; S. J. Wittman.

Ex-officio members of Board: Dr. Walter A. Good, E. N. Angus, and Russell W. Nichols, Academy of Model Aeronautics; Dr. K. Richard Johnson, president, and Miss Marilyn Link, National Aviation Education Council; Joe Crane, Parachute Club of America; Paul A. Schweizer, Soaring Society of America; and S. J. Wittman, Professional Race Pilots Association.

NAA Contest Board: Roger Wolfe Kahn, chairman; Charles S. Logsdon, secretary.

Academy of Model Aeronautics (division of NAA): Walter A. Good, president; Leo B. Dixon, chairman, Contest Board; Russell W. Nichols, executive director.

National Aeronautic Association headquarters are in Washington. The Association publishes a monthly magazine, *National Aeronautics*. A number of affiliated groups also have their own publications.—END

A WORLD CONGRESS O

The National Business Aircraft A

A "BUSINESS FLEET" of more than 28,000 planes logged 5,000,000 hours of flight time in this country last year.

More than 7,000 US companies own planes and operate them in routine prosecution of business enterprises. This does not include firms whose business itself is flying—like airlines, air taxi services, plane rental concerns, etc.

An additional 10,000 private aircraft used primarily for other purposes did some "business flying" last year.

Business aircraft recorded more time in the air than any other single category of plane other than military. Passenger airlines by comparison showed somewhere in the neighborhood of 4,000,000 flight hours in domestic traffic.

Total investment in America's business plane fleet totals more than $1 billion.

The figures tell the little-publicized story of a striking development on America's airlanes. They also introduce one of the five cooperating agencies behind the World Congress of Flight—the National Business Aircraft Association, Inc.

A Peaceful Revolution in American Life

A substantial segment of the nation's business has taken to wings—its own wings. The process has been part and parcel of the peaceful revolution that has occurred in many facets of American life since the second world war.

A homely analogy places the picture in perspective. The company-owned plane is to business what the automobile is to the private family. It supplies a key entity in mid-twentieth century America—mobility compounded with flexibility.

The automobile made possible the migration to the suburbs that changed the social face of America. In the process, the family car became an outright necessity.

The company plane, similarly, has allowed American business to pursue vast expansion and decentralization programs with unprecedented ease of transportation. To many firms, it's almost as much a necessity as the car parked outside the ranch house.

Nationwide airlines, of course, do part of the job of zooming executives, company employees, and sales personnel on their hectic rounds. But, in a demanding go-go schedule of business activities, an airline schedule may sometimes seem an unbearable strait jacket. Then, in addition, there are still many localities not served directly and continually by airlines.

Of the approximately 6,000 airports in the country, only about 600—or ten percent—are served by regular airlines. And it is in just these less populated regions that an untapped resource, an untapped market, or a sprawling new plant may be located.

This, then, is a thumbnail sketch of an historical phenomenon hardly predictable at the end of the war, when there were only about 2,000 business aircraft in operation—and a small group of businessmen formed the National Business Aircraft Association.

Today the NBAA, a service organization of business plane owners, has among its membership an impressive cross-cut of America's top companies as well as smaller enterprises that operate one or more planes. (Operation of business craft, it might be pointed out, is distinctly not restricted to million-dollar outfits.)

A brief roll-call of members includes the Ford Motor Company, Minneapolis-Honeywell, Sperry, Anheuser-Busch, Coca-Cola, Dow Chemicals, Monsanto, General Electric, Knox Gelatin, National Dairy, Anchor Hocking Glass, Procter and Gamble, ALCOA, Radio Corporation of America, Bethlehem Steel, Burlington Mills, Arthur Godfrey, and the Port of New York Authority—or any number of similar combinations of familiar names.

A major proportion of business aircraft manufacturing concerns and aviation equipment companies are associate members of NBAA. Regular membership, however, is restricted to nonaviation companies or individuals using planes for "transportation in carrying out the operations of their given enterprises or professions." Excluded are those using planes specifically "for commercial purposes."

An independent, nonprofit organization, the NBAA was originally incorporated in the state of New York in 1947. It transferred national headquarters to Washington, D. C., in 1951.

Aim of the NBAA from the start has been "to enable business aircraft owners to present a united front in all matters where organized action is necessary to bring about improvement in aircraft, equipment, and service; and to further the cause of safety and economy of business aircraft operation."

Increases in Planes and Problems

Among its continuing programs are:

1. Supporting development and improvement of airports in off-airways industrial communities.
2. Advocating expansion of communication and air navigation aid facilities for area flying.
3. Encouraging interchange of business flying information on administration, operations, and maintenance.
4. Representing membership before government boards, committees, and private industry groups.

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JOSEPH B. BURNS
President, NBAA

5. Opposing discriminatory laws, rules, and regulations affecting business flying.

6. Furthering understanding of the advantages of business aircraft ownership.

In addition, NBAA issues a "Directory of Business Aircraft," sponsors regional conferences on aviation problems, offers "special services" of broad description to its membership, and supervises wide exchange of essential aviation information among members.

The range of major issues in which NBAA is involved, as well as specific aviation problems in which it is concerned, have obviously increased many-fold in the past twelve years.

At the end of 1958 there were 28,483 planes in the United States used primarily for business purposes, and 3,842 of these were multiengined. Almost 200 helicopters, incidentally, were also in use for private business transportation. Of the 2,000 business planes in the country in 1946, only a few hundred were multiengine.

Questions of flight safety, navigation, airport development, aircraft maintenance, aircrew standards and training, economic operation, scheduling of flights, aviation administration, instrumentation, inflight feeding, and a host of related matters important to NBAA and its members naturally bulk larger with increases in the size and number of planes and stepped-up traffic.

Founded at the Wings Club

NBAA feels it has played a vital part in the spectacular growth of business aviation, which got rolling not long after the organization was founded. In the words of the Association's official history:

"The use of aircraft in business might still be a small, struggling phase of aviation, if it were not for the determination of a group of men who met at the Wings Club (New York) in the spring of 1946 to take a searching look at air operations. What they saw in those hectic postwar days was both discouraging and encouraging.

"On the bright side was a resurgence of flying—commercial, business, and personal. The commercial airlines were beginning a new period of expansion; independent nonscheduled freight and passenger operators sprang up on all sides, and business firms, remembering the utility of aircraft during the war, were turning to air transportation to meet the accelerating tempo of competition.

"On the darker side of the picture, they saw airports and airways jammed beyond their capacity to handle the unprecedented volume of new air traffic. They saw, too, that the regulatory agencies were proposing drastic and even unwise measures to cope with traffic control problems."

The Wings Club group felt that "the interests of business flying" were likely to "suffer in the scramble for airspace and recognition" because business aviation operators were not organized as other segments of the air operations industry.

Prime mover of this parley was acknowledged to be the late Palmer J. (Bud) Lathrop, an Air Force officer in the war who was then vice president of Bristol-Myers and later became president of the Cameron Machinery Company. Others present represented Continental Can, Johnson & Johnson, Time-Life, the Manufacturers Trust Company, Atlantic Aviation Company, and the Aircraft Industries Association.

These men scheduled a larger-scale session on the subject of business aviation to be held during the Cleveland Air Show later that year and the association formally came into being the following year under the soon-to-be-changed name, "Corporation Aircraft Owners Association."

The NBAA is governed by a board of directors elected annually. This is made up of five officials of member firms and four pilots employed by member firms. A president and executive director head the national headquarters staff in Washington.

New Growth Is Expected

Top NBAA officials at present are: president, Joseph B. Burns, Fuller Brush Company; executive vice president, B. J. Bergesen, Ford Motor Company; treasurer, John H. Winant, Sprague Electric Company; and William K. Lawton, executive director.

Other members of the board of directors represent General Electric, Sinclair Refining Company, International Harvester Company, Texas Eastern Transmission Corporation, The Hubinger Company of Keokuk, Iowa, ARMCO Steel Corporation, and Continental Oil.

NBAA's faith in the growth of business aviation is yet undiminished. There are some 40,000 corporations in the country with assets of $1 million or more and most of these have interstate business connections or interests. At a lower level, there are about 30,000 companies with assets between half a million and one million dollars. The organization expects that, with a continuance of present patterns, a large proportion of these will move into the field of business aviation.

"If past experience can be used as a guide to the future," the NBAA declares, "we can look forward to years of steady growth and an ever-widening sphere of influence."

—END

WORLD CONGRESS O

Participating

THESE are the participating agencies in the World Congress of Flight—organizations in addition to the six cooperating agencies that will be actively represented at Las Vegas. Many will play leading roles in the program of the World Congress. Some will hold major meetings of their own in connection with it.

● **The Aero Medical Association (AMA)** is made up of leading physicians and scientists in the field of aviation medicine from throughout the free world. More than 100 technical papers on all facets of the field are read at annual AMA meetings. The official AMA monthly, *The Journal of Aviation Medicine,* ranges through major areas including flight equipment, space travel, crew safety, aging pilots, psycho-physiological problems, and emergency escape. The AMA was founded in 1929. Its annual convention is slated for Los Angeles after the World Congress of Flight. AMA will have an exhibit at Las Vegas.

● **The Aeronautical Training Society (ATS)** is a national organization of Air Force and Army contract, primary, instrument, and ROTC flight-training schools. It also includes maintenance contractors, technical schools, refueling operators, companies engaged in other contract aviation services. Member schools have trained some 450,000 civil and military pilots since ATS was founded in 1942. Main ATS aim is to advance the contract concept in areas where private groups have something to offer civil or military aviation. ATS holds its seventeenth annual meeting in Las Vegas on April 16.

● **The Aircraft Service Association (TASA)** is composed of a dozen leading companies operating twenty-seven military and civil aircraft maintenance, overhaul, and modification plants. The groups represent a private investment of more than $100 million. Member companies of the Association have been in business an average of seventeen years, maintain six million square feet of plant space, 161 million square feet of ramp work space. Many thousands of military, airline, and general aircraft have been serviced for customers around the world. TASA holds an Association meeting during the World Congress.

● **The Air Materiel Command (AMC),** Wright-Patterson AFB, Ohio, is the logistics arm of the Air Force. It buys, stores, transports, and maintains aircraft, weapons, and all equipment used by USAF. Air Materiel Command has materiel areas, depots, and plant representatives at most of Air Force prime contractors' plants. AMC is also in charge of procurement of aircraft and materiel for more than thirty nations under the Mutual Defense Assistance Pact. AMC will maintain an information center at the World Congress of Flight.

● **The Air Research and Development Command (ARDC),** Andrews AFB, Md., undertakes research and development programs to provide new and improved weapons, equipment, and techniques for the Air Force. Responsible for conducting tests on new materiel and for programming, evaluating, and directing research and development field activities, ARDC awards contracts to industrial concerns, colleges, universities, and nonprofit institutions. ARDC will sponsor a symposium on international research for the Air Force and will have an information center at the World Congress of Flight.

● The two-year-old **Association of Local and Territorial Airlines (ALTA)** is composed of fifteen member concerns holding certificates as local or territorial airlines. The member airlines are Alaska, Allegheny, Aloha, Bonanza, Central, Frontier, Hawaiian, Lake Central, Mohawk, Northern Consolidated, Ozark, Pacific, Reeve Aleutian, West Coast, and Wien Alaska. The members are pledged to try to improve service, cooperate to reduce subsidies, strengthen their operations in general. ALTA holds an executive board meeting during the World Congress of Flight in Las Vegas and its executive director, Joseph P. Adams, will give a major address.

● **The Aviation Writers Association (AWA)** is made up of 900 men and women concerned with aviation writing in this country and Canada. It was formed in 1938 to "establish and maintain high standards of quality and veracity in gathering, writing, editing, and disseminating aeronautical information." Members must be aviation writers, editors, and publishers of American or Canadian newspapers, magazines, radio-TV services. Public relations men and others may hold associate membership. AWA has scheduled a meeting of its board during the World Congress.

● **The Business and Defense Services Administration (BDSA),** an agency of the Department of Commerce, is responsible for carrying out the latter's programs relating to defense production, long-range industrial preparedness, service to the business community. BDSA provides information, advisory services to American business and industry, acts as a clearinghouse for pertinent government technological information. Under guidance of the Office of Defense Mobilization, BDSA develops plans for industrial and economic mobilization. It will have an information center and exhibit at the World Congress.

● **The Early Birds** are a group of aviators who got off the ground early in the age of flight. To achieve membership, an American must have piloted a glider, balloon, airplane, or airship prior to December 17, 1916. Nationals of countries other than the United States that took part in World War I must have done so before August 4, 1914. The Early Birds, a social organization, met first in Chicago in 1928. Since then, some 250 members have died; membership now stands at more than 300. The Early Birds have slated a general meeting to take place during the World Congress.

● The new **Federal Aviation Agency (FAA),** formed by Congress in August 1958, combines in one agency functions formerly vested in the Civil Aeronautics Administration, Airways Modernization Board, and the Civil Aeronautics Board safety offices. FAA is responsible for safe, orderly operation of air traffic—in terms of aircraft, personnel, airports, navigation systems, equipment, associated factors. Private, military, airline, business flying come within FAA's purview. Established FAA aim is to foster the growth and development of aviation. It cooperates

Organizations

also with foreign governments on aviation matters. FAA's director, Gen. Elwood R. Quesada, will speak at the World Congress. FAA will run an information center and exhibit new air-traffic control equipment and its Convair 440 flight-check aircraft.

● **The Federation Aeronautique Internationale (FAI)**, founded in Paris in 1905, is concerned with international cooperation in many fields, including air-age education. FAI has an active membership of aero clubs in nearly fifty nations. The Federation certifies aviation records for sporting and private aviation throughout the world, is active in all phases of flying. The group holds its annual convention in Moscow in May. FAI cosponsors the International Conference on Aerospace Education at the World Congress of Flight.

● **The Flying Physicians Association (FPA)** is a four-year-old nationwide organization of 1,600 licensed physicians who hold valid pilots' licenses. The Association has prepared a disaster program to provide 1,500 planes and pilots to carry doctors, nurses, medical supplies to stricken areas. Other programs are encouragement of instrument proficiency among members, promotion of safety, stimulation of aviation consciousness in young men and women and within professional ranks, cooperation with government agencies. FPA holds a board meeting at Las Vegas and will exhibit.

● **US Army Ordnance's Frankford Arsenal** in Philadelphia is one of the oldest practitioners of the "in-house" system of weapon development. Frankford Arsenal performs research and development on cartridge and propellant-actuated systems and devices for aircraft; ballistic missiles, space vehicle systems; solid-propellant gas generators; catapults and rocket-catapults; thrusters; ejectors; low-energy detonating cord; ignition elements; initiators. Frankford Arsenal will be an exhibitor at the World Congress.

● **The International Air Transport Association (IATA)** is a worldwide organization of scheduled airlines. Its eighty-seven member airlines carry the great bulk of the world's scheduled international and domestic air traffic under the flags of more than fifty nations. Founded in 1945, IATA is a voluntary, nonexclusive, nonpolitical organization. Financed completely from dues paid by member airlines, IATA has a twofold purpose: operational and commercial. IATA represents a constant effort by the airlines to improve every aspect of service. Britain's Sir William Hildred, the IATA's director general, speaks at the World Congress.

● **The International Civil Aviation Organization (ICAO)** is a specialized agency of the United Nations established in 1947. It is charged with administration of the principles established by the Convention on International Aviation held at Chicago in 1944. As of 1958, ICAO had seventy-one member nations. Main objectives are to develop principles and techniques of international air navigation, coordinated planning and development of international air transport. ICAO is governed by an assembly and a top council. ICAO's Council President, Walter Binaghi of Argentina, will be one of the speakers at the World Congress.

● **The Immigration and Naturalization Service of the US Department of Justice** controls admission, exclusion, deportation of aliens; administers naturalization of resident aliens; mans border-patrol stations. It cooperates with the public schools to provide citizenship textbooks and other services to prepare alien candidates for United States citizenship. The Service is exhibiting at the World Congress of Flight.

● **The Link Foundation** was founded six years ago by Edwin A. Link, creator of the family of Link aviation training aids. Organized with the purpose of advancing scientific, technological, and general education projects, as well as taking part in charitable work, the Foundation last year awarded annual fellowships of $1,500 each to four universities, granted two individual fellowships in like amount, and made several research and development grants ranging from $500 to $4,000. Three of these were to nonuniversity aeronautics projects. The Foundation, in cooperation with other agencies, cosponsors the International Conference on Aerospace Education at the World Congress.

● **The National Aeronautics and Space Administration (NASA)** is the new civilian space agency now charting such programs as the Project Mercury effort to place a man in orbit and the million-pound-thrust rocket engine. NASA was established last year as successor to the old NACA. It has a heavy schedule of contracted space research and development under way at present in conjunction with industry, the armed services, other government groups. Has 8,000 employees, a $335 million budget for FY '59. NASA will run a WCF exhibit and participate in the Space Age Conference.

● **The National Air Taxi Conference (NATC)** is an organization of some 140 air taxi companies organized in 1950. Its aim is to establish specific standards of safe and efficient operation and promote the concept of "flying all the way," using air taxi service to and from off-airline points. Last year was members' third in a row of accident-free operations. Current projects include developing over-all trip insurance, members to offer accident coverage similar to that on scheduled airlines, with which NATC works closely. NATC holds a board meeting during the WCF.

● **The National Association of State Aviation Officials (NASAO)** seeks to develop uniform state aviation laws and regulations and encourage aviation cooperation among the states. Formed in 1931, its membership consists of state aeronautics commissions, departments throughout the nation. NASAO acts in conjunction with the federal government and aviation groups. NASAO and the Flight Safety Foundation, a WCF cooperating agency, will sponsor a safety symposium for private pilots at Las Vegas. NASAO will present safety certificates. Its board of directors meets there on April 16.

● **The National Defense Transportation Association (NDTA)** is a military-civilian group of 11,000 men and women in the

services, federal government, and private industry interested in promotion of transportation preparedness for national defense. Founded after World War II, NDTA seeks establishment of improved, restricted roads between airports and other transport terminals, more advanced cargo handling, better integrated use of rail, motor, air, water transport. NDTA's Executive Committee has formally endorsed WCF and is sending an official delegation to participate. NDTA also will have an exhibit.

● **The National Pilots' Association (NPA)** is a general aviation group for licensed pilots, civilian and military. It is the pilots' affiliate of the National Aeronautic Association. The group acts regionally through pilots' meetings, nationally through Washington headquarters, which keep in close touch with government agencies. NPA is running a series of pilots' forums to raise flight standards. NPA will sponsor the Symposium on the Efficient Use of Airspace at the Congress, will also run an exhibit.

● **The Ninety Nines** is an organization of licensed women pilots. It has some 1,300 members within the US, Puerto Rico, and Canada, and members-at-large in England, France, Turkey, Australia, Brazil, Japan, Switzerland, the French and British West Indies. Nearly all women's flight records of recent years have been set by members. The group was formed in 1929 and took its name from the number of charter members. It sponsors a number of education projects plus air shows and races, awards an annual cash prize to a woman aviator. Ninety Nines will hold meetings at the World Congress.

● **The North Atlantic Treaty Organization (NATO)** came into being in 1949 in response to Communist pressures, including the Berlin blockade of 1948. NATO has fifteen member nations. The basic doctrine underlying the NATO Alliance is deterrence of aggression by the "sword" of strategic air and the "shield" of joint conventional ground forces. The North Atlantic Council is the legislative branch of NATO; Belgium's Paul-Henri Spaak is Secretary General. USAF Gen. Lauris Norstad is NATO's Supreme Commander. NATO will have two aerobatic teams (Italy and the Netherlands) and an exhibit at the World Congress.

● **The Office of Education of the US Department of Health, Education, and Welfare** is the principal agency of the government responsible for formulation and coordination of educational activities at the national level. It cooperates with state, local, and professional groups. The administration of federal grants for land-grant colleges is the direct responsibility of the Office of Education, as is recruitment of teachers to work overseas. It is a cosponsor of the International Conference on Aerospace Education at the World Congress of Flight.

● **The OX-5 Club of America** is an organization formed in 1955 to perpetuate the memories of thousands of pilots who flew OX-5-powered aircraft before the last war. It commemorates the contribution made to aviation by designers and owners of these planes and works actively for aviation progress. The Club has a membership of about 6,000, with Wings chartered in many states and Canada. Membership is limited to persons who piloted OX-5-powered planes before December 31, 1940, or took part in designing them or keeping them in the air. OX-5 holds a general meeting at Las Vegas.

● **The Pan American Union** is successor to the Union of American Republics, established in 1891. The charter of organization of Pan American states was signed in 1948. The organization actually is the executive branch, or general secretariat, of the twenty-one-nation Organization of American States. A regional agency under the United Nations Charter, it has as its aims peace and justice in the Western Hemisphere, promotion of solidarity of American states, defense of their territorial integrity, sovereignty, and independence. Pan American Day will be celebrated at the World Congress, and the Pan American Union will have an exhibit.

● **The Reserve Officers' Association (ROA)** was founded in the early 1920s by former World War I officers who felt that a need existed for an organization that could speak for Reservists of all services. The Association is interested in national preparedness and in the maintenance of an effective military posture. ROA has a membership of 67,000, of whom 12,000 are former Air Force officers. The Air Force Affairs Committee, which represents the Air Force members of the Reserve Officers' Association, has scheduled a meeting at the World Congress of Flight.

● **The Small Business Administration (SBA),** a government agency under general direction and supervision of the President, is devoted exclusively to small business interests. Its functions are to protect the interests of small business concerns, ensure that a fair proportion of total government purchases and contracts are placed with small firms, and make loans to small businesses. One of its chief missions is to encourage the letting of subcontracts to small firms by prime contractors dealing with the government. It will have an information center and an exhibit at the World Congress.

● **The Soaring Society of America,** an affiliate of the NAA, fosters and promotes all phases of gliding on a national and international basis. Total membership is about 2,000. SSA supervises establishment of world class soaring records and issues FAI performance badges, sanctions and maintains standards for regional and annual national contests. It also selects the US team for the biannual international soaring contest. Publishes annual directories, lists of records and awards, other information. It will participate in air demonstrations at the World Congress.

● **The Society for Experimental Test Pilots (SETP)** is a three-year-old professional society of test pilots. It has more than 200 members from nearly every major airframe and engine company, the military services, government, and private groups. Its aims: promote safety, evaluate equipment, contribute to aviation progress, exchange information on testing and escape and survival, conduct lectures, other educational programs. Industry takes part in SETP through corporate memberships. It will sponsor the International Test Pilots Symposium at the WCF and run an exhibit.

● **The United States Committee for the United Nations** is a nongovernmental, nonprofit organization that exists to disseminate information about, and to enhance interest in, the United Nations. Although the committee, established in 1948, is a private association, the chairman of the board is appointed annually by the President of the United States. The industry participation division of the committee will be represented at the World Congress.

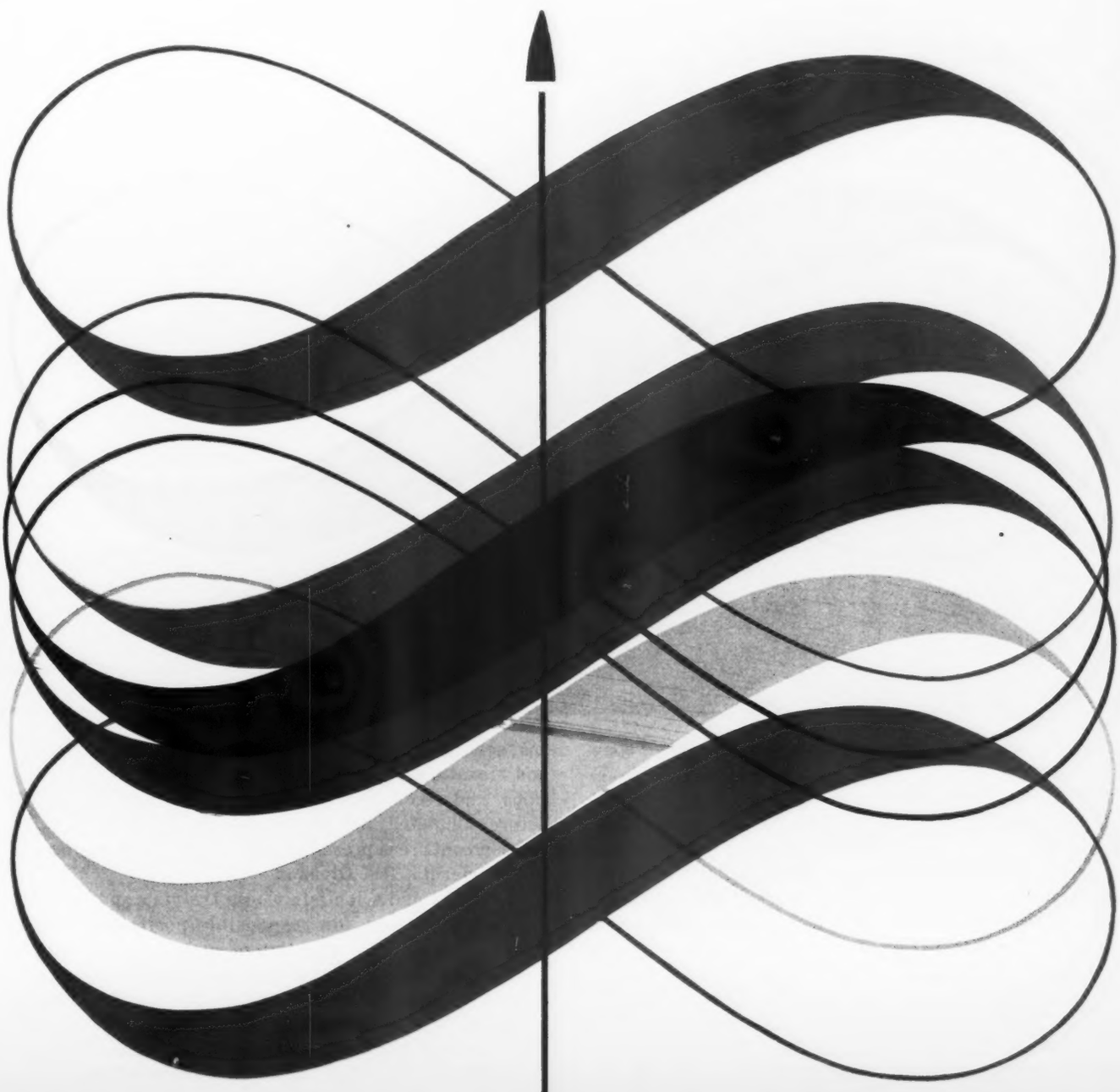
● **The University Aviation Association (UAA)** is a national organization of educators concerned with meeting the social, political, and economic challenges of the aerospace age. It sponsors the National Intercollegiate Flying Association, a series of continuing lectures, teacher training programs. UAA consults with schools and universities on curriculum offerings. UAA is a cosponsor of the International Conference on Aerospace Education and will present an award to an outstanding educator at a luncheon program. The UAA board of directors meets on April 15 and 16.

● **The West Coast Electronics Manufacturers Association (WCEMA)** is an organization of 285 member firms in eleven western states that produce twenty-four percent of the nation's electronic equipment. It promotes healthy aspects of competition among members on products, personnel, services. WCEMA sponsors trade shows, symposia, conferences, has a major scholarship fund contributing to western universities. Acts in many fields for members on group basis, including a program to train more technical manpower for the industry. Will hold a board meeting during the World Congress.—END

April • 1959

SPACE DIGEST

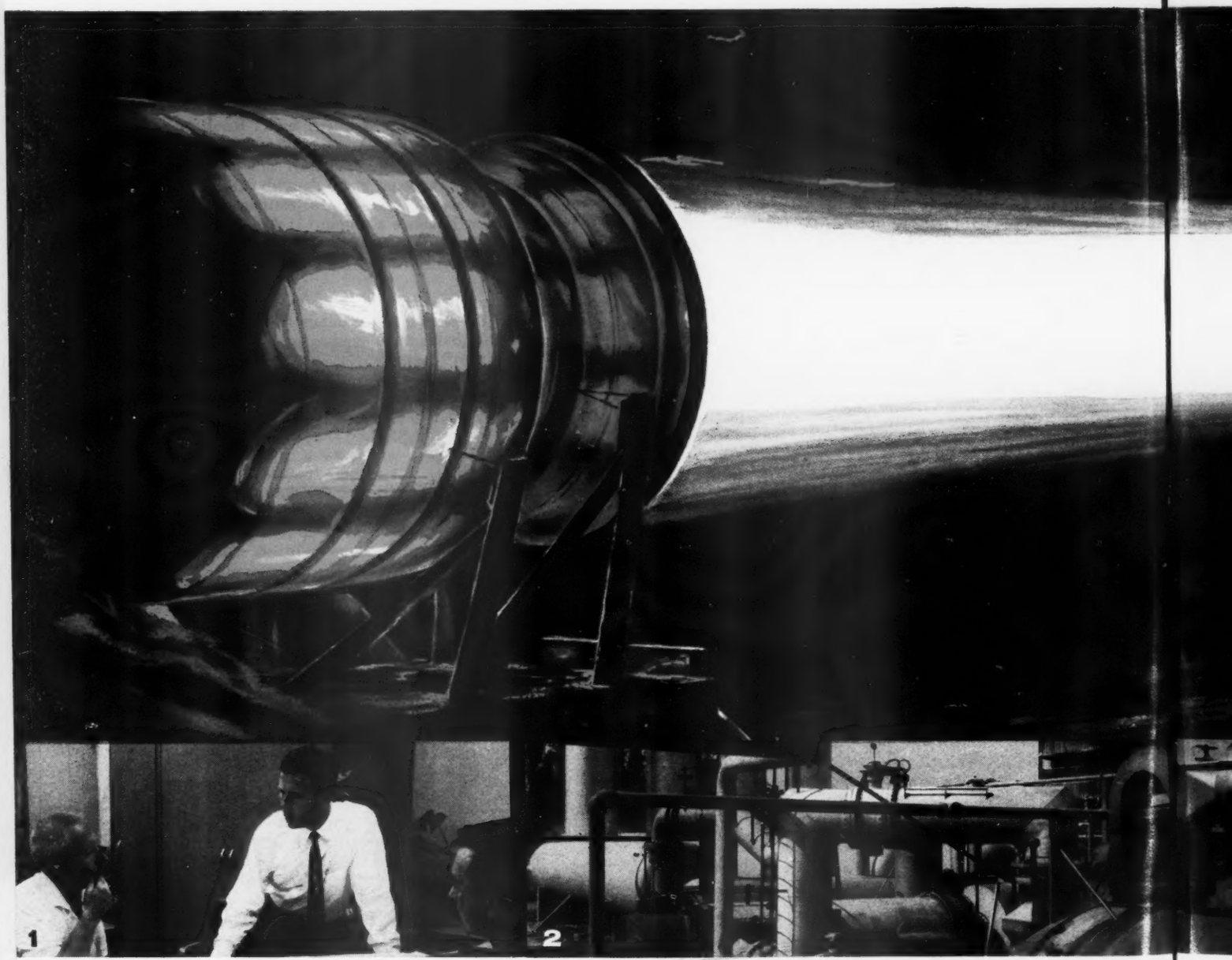
THE SPACE AGE IN PERSPECTIVE



Marquardt

ADVANCED TEST FACILITIES

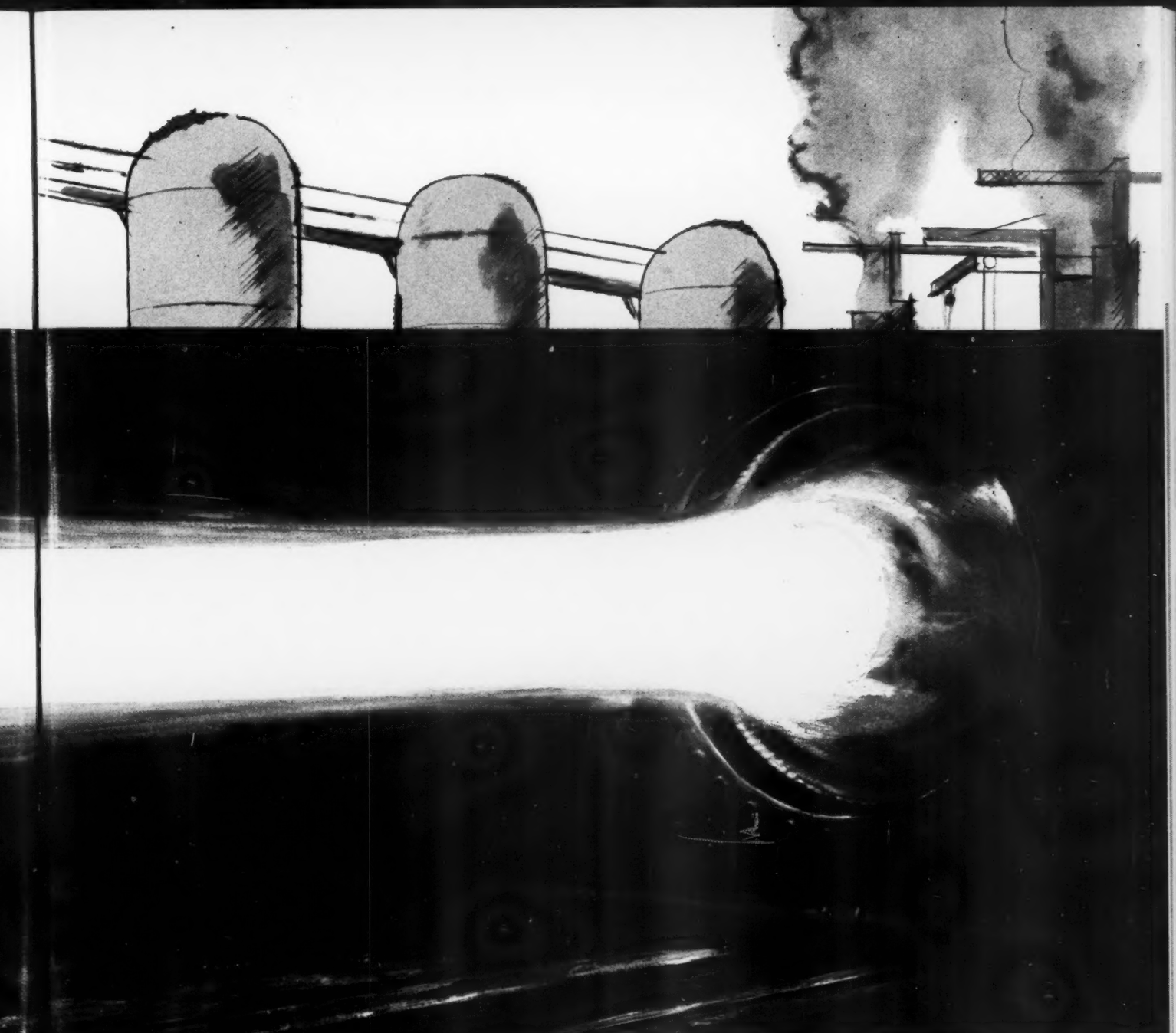
FOR AIR AND SPACE

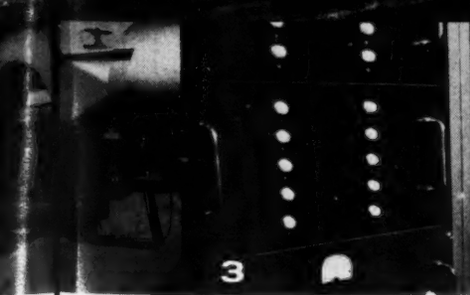


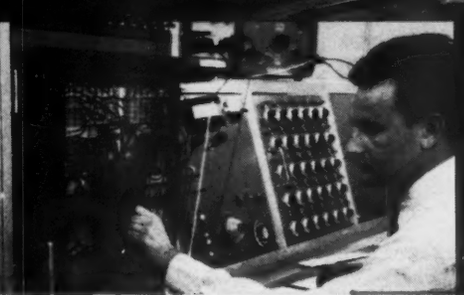
Test facilities conceived, designed, developed, and operated by Marquardt Aircraft—which include the USAF-Marquardt Jet Laboratory and test installations of the U. S. Navy—perform an important role in the development of advanced propulsion systems, controls and accessories for air and space operations. Here, in a creative engineering environment, professional engineers specializing in analysis, design, and operation of test equipment are constantly challenged by the complex requirements which must be satisfied to support critical development programs, including test support for long-range space research projects currently underway. Simulation of high altitude engine and equipment operating conditions, handling and testing with new chemical fuels, solving the problems of extreme temperatures and vibration, extrapolation of data for space applications, and recording test data under conditions never before simulated, are only a few of the research and development areas presently being explored by engineers in Marquardt's Test Division.

Engineers and scientists whose training and experience qualify them for responsible positions in the analysis, design, and operation of such advanced facilities will find full opportunity to demonstrate their talents at Marquardt. May I suggest you contact Mr. Floyd E. Hargiss, Manager of the Professional Personnel Department, 16547 Saticoy Street, Van Nuys, California.

Roy E. Marquardt, *President*







1—Test Division engineers under Chief Engineer Leigh Dunn (center) pioneer advanced development programs in Marquardt's unique and modern test facilities. Professional engineers wishing to join this creative engineering environment will find opportunities in many fields, including:

2—Facility Design—Engineers experienced in design, mechanical and thermodynamic analysis of industrial processes including systems for large air flow, steam, fuels, propellants, and oxidizers for both cryogenic and extreme temperatures.

3—Instrumentation—Engineers to advance the design of high-speed recording systems and analog computers and to use these systems in the collection of test data.

4—Facility Operations—Engineers to coordinate and supervise the setup and operation of test programs for supersonic jet engines, engine controls, and rotating accessories.

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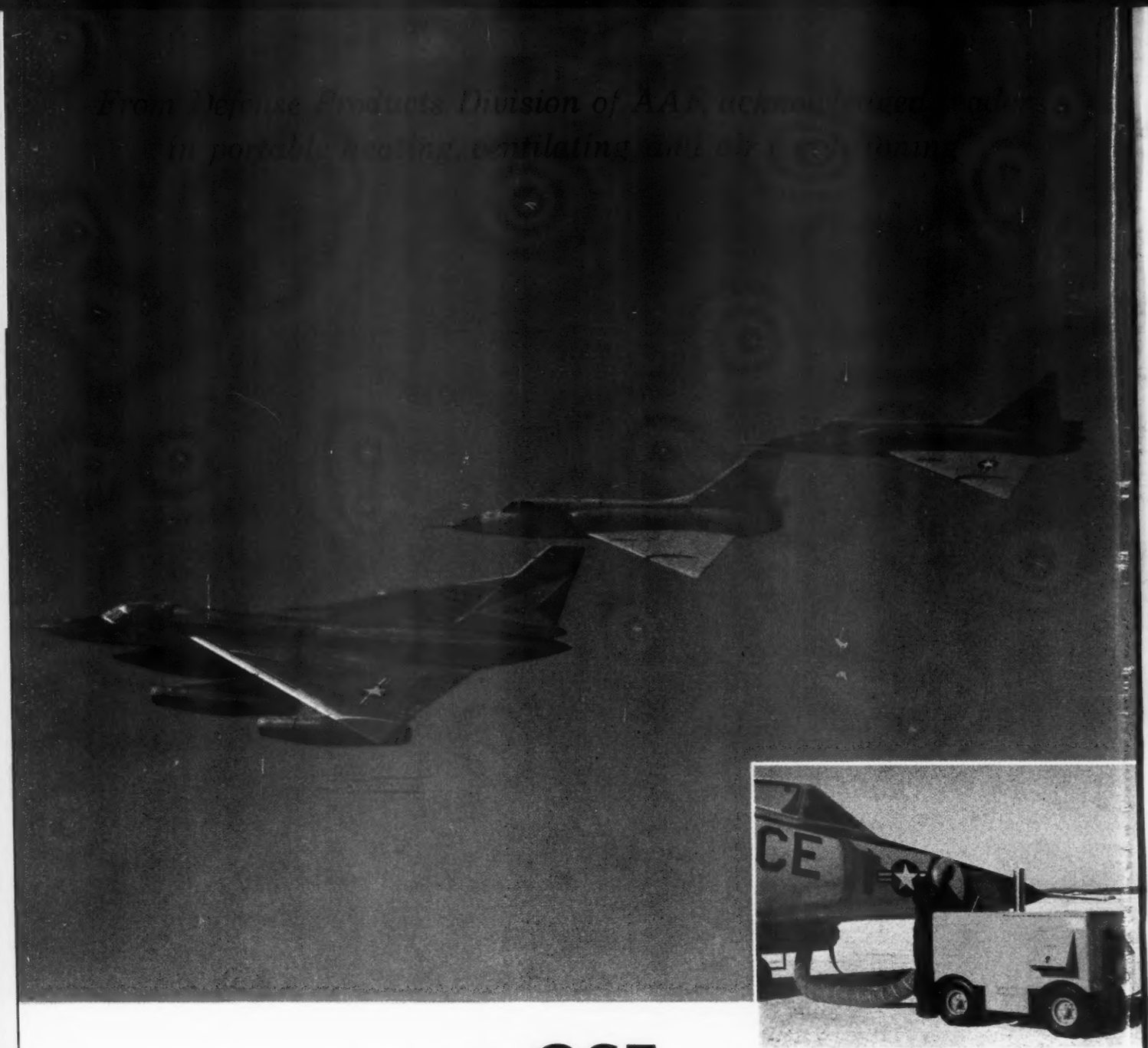

HERMAN NELSON portable heating and ventilating unit for the F-102. Each system presented a different problem; each required specially designed equipment. For each, Convair turned to AAF Defense Products Division.

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American Air Filter COMPANY, INC.

DEFENSE PRODUCTS DIVISION, ROCK ISLAND, ILLINOIS

VOLUME 2; NUMBER 4 • APRIL 1959

SPACE DIGEST

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From the Editors...

WHEN SPACE DIGEST was announced, we promised a continuing presentation of the space age in perspective, a cross section of ideas, from varied sources, on the problems and potential of the new age that is rushing in on us.

This month's lineup of contents keeps us busy on that mission. Our series on the National Space Effort focuses this month on the National Aeronautics and Space Administration, how it is fulfilling its broad assignment and the problems it faces under a less-than-crystal-clear set of ground rules. Complementing the NASA story are two enlightening discussions by leading scientists on the eventual payoffs possible through space research and the question of possible difficulties ahead for university researchers increasingly dependent on nonscientific "administrators" for funds and direction of their forays into the future.

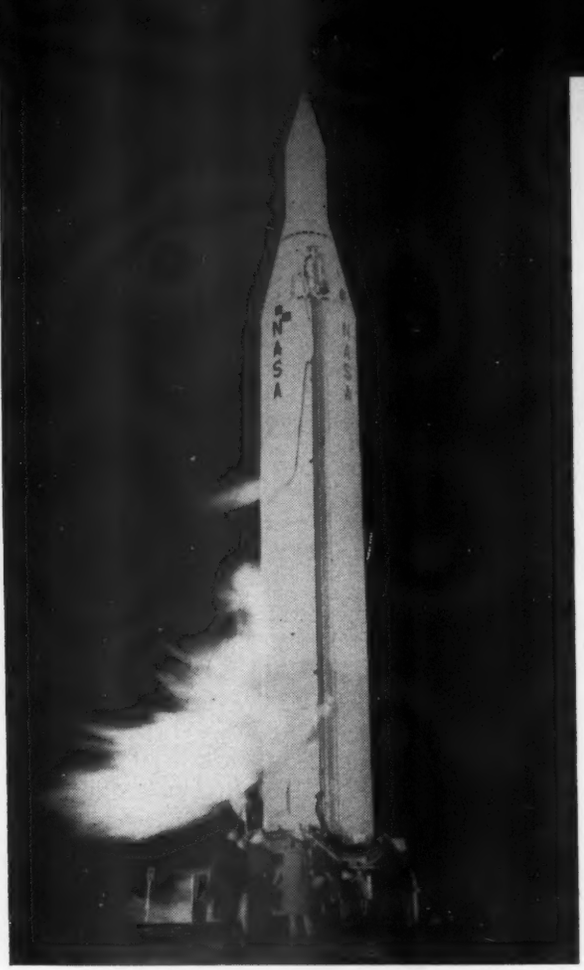
On the lighter but astronautically significant side are articles on the "weird world of weightlessness" that obtains in space travel and the importance of that common household item—paint—in the space age.

And just to remind us that those Russians are still cerebrating, we have included a translation of a recent Soviet article on the possibility of using electromagnetic energy in space for vehicle propulsion. The Russian article came not from a deep technical journal, but from an engineering magazine for youth.

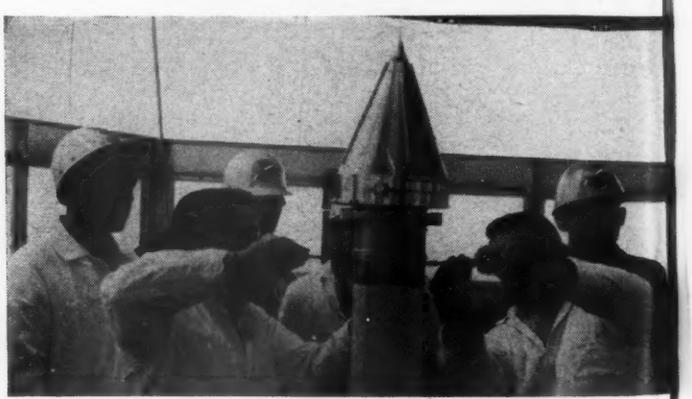
Pioneer, Vanguard, Discoverer mark opening of busy season for US space technologists

SPACE 'TRAFFIC' PICKS UP

WILLIAM LEAVITT
Associate Editor

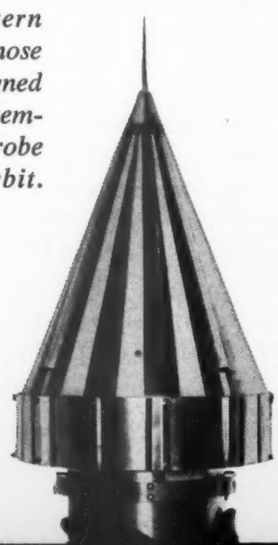


Overflow oxygen from Pioneer IV's first stage is whipped aside by winds moments before the launch.



Final adjustments on Pioneer are made by NASA-JPL specialists high in the air aboard the gantry.

Striped pattern on Pioneer nose cone is designed to balance temperature as probe rides in orbit.



IN THE special world of astronautics, it just isn't true, as Tin Pan Alley used to have it, that "the moon belongs to everyone—the best things in life are free." Some authorities are suggesting that our nearest celestial neighbor will probably belong to the first nation that gets a foothold on it, and to do that job will cost millions, maybe billions of dollars or rubles, depending on which side of the Iron Curtain you're taking off from. Of course, a full-scale, internationally run space-exploration program could change these stern realities, but cold-war tensions make that sort of an ideal fairly remote today.

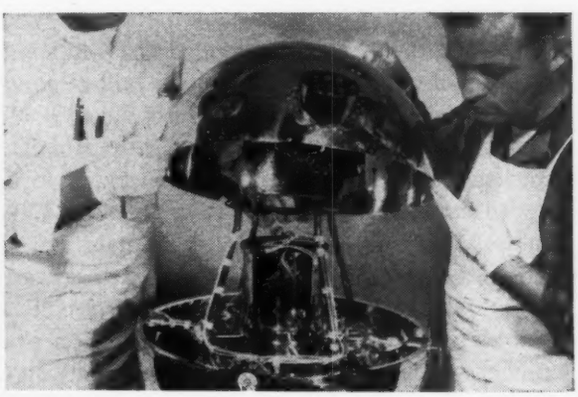
As this issue of SPACE DIGEST went to press, the

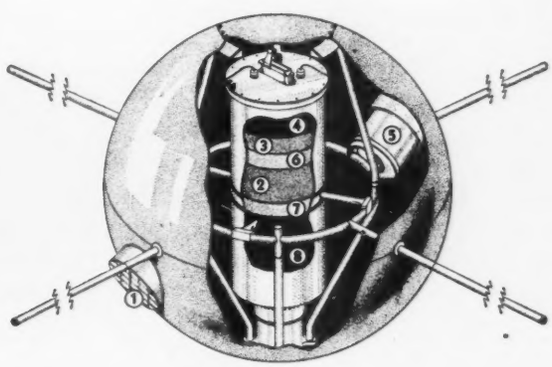
American tempo in the space race was definitely picking up. In the less than thirty days from mid-February to early March, three—or, more strictly speaking, two and a half—major space accomplishments were registered for our side.

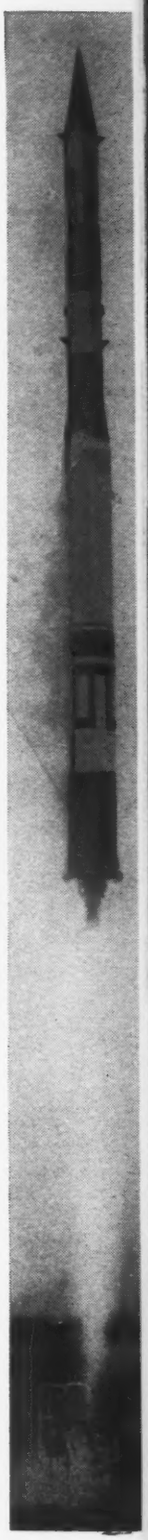
On February 17 the US, under National Aeronautics and Space Administration auspices, successfully launched into eastward orbit the world's first weather observation satellite, Vanguard II, designed to track the cloud formations surrounding the earth. The 20¾-pound, twenty-inch-diameter satellite, contained two photocells capable of distinguishing between cloud masses and land and sea areas by sensing differences in reflected sunlight. Since cloud masses ride the giant swirling air currents that cause weather changes, an accurate picture of cloud mass locations would provide meteorologists with a large-scale picture of weather to come.

Vanguard developed a wobble which caused overlapping in the patterns it transmitted. At this writing, National Aeronautics and Space Administration scientists were working on the received patterns and were hopeful corrections could be made to yield a meaningful picture.

The important thing was that the feasibility of meteorological satellites had been demonstrated. For those who questioned heavy expenditures on space technology, the possibility of really long-range weather forecasting pointed the way to potential great monetary savings in such areas as agriculture and shipping. With Vanguard, weather forecasting joined communications, demonstrated by last year's "talking" Atlas satellite launched by USAF for the Advanced Research Projects Agency, as a practical future use for space vehicles. And Vanguard's successors will carry solar batteries, allowing permanent data transmission—and





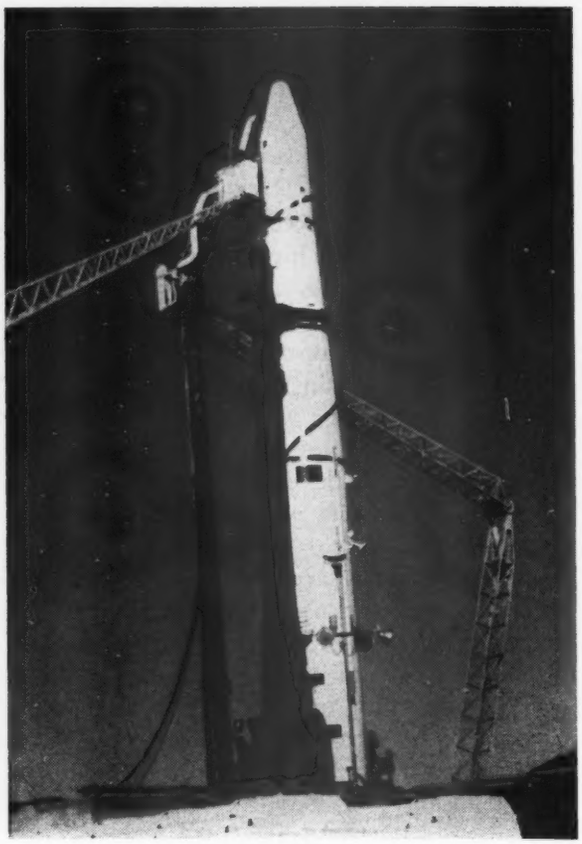


Left, technicians lower top onto Vanguard weather satellite prior to launch. Center, cutaway of Vanguard instrumentation showing (1) photocell light shield, (2) recorder, (3) interrogation radio receiver, (4) data transmitter, (5) photocell, (6) data electronics, (7) tracking transmitter, (8) mercury batteries. At right, the camera's eye view of the fiery liftoff of the world's first weather satellite, Vanguard II.

Vanguard II, whose transmitters were powered by mercury batteries expected to last about two weeks (they lasted eighteen days), successfully transmitted patterns of cloud formations, although the satellite itself is expected by some experts to stay in orbit a century or more. But there was a hitch; the satellite's spin mechanism, designed to point the photocells so that one always faced the sunlit portion of the earth, did not work perfectly.

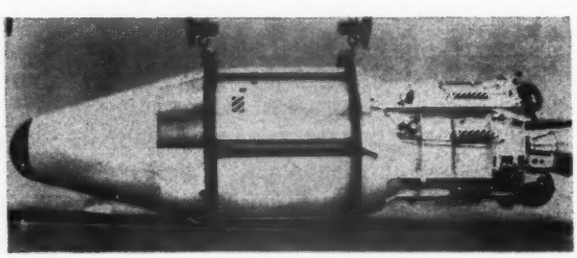
will probably travel in polar orbits, giving a picture of the entire surface of the planet.

February also saw the opening of the space age's Bureau of Missing Satellites. The Air Force on February 28 fired the first vehicle ever launched into a polar orbit. This was the long-heralded first of the Discoverer satellite series, under the aegis of the Defense Department's Advanced Research Projects Agency. Random signals received minutes



Launch-pad people check Discoverer "umbilical" connections atop cranes in preparing for liftoff.

after liftoff suggested that the Discoverer had headed into orbit with its forty-pound payload, but for still unexplained reasons the satellite's radio frequency was not released to civilian tracking people. This made it impossible, according to the Smithsonian Astrophysical Observatory at Cambridge, Mass., for the observatory's people to track Discoverer. Discoverer's difficulties were compounded by its very weak and sporadic radio signal. By the first week in March a Swedish observatory reported what it believed to be Discoverer signals, and the consensus was that the vehicle had indeed gone into orbit. Whatever happened to Discoverer, its low orbit gave it a life expectancy of thirty days or a little more.



Discoverer payload poses for picture before launch. Signals now indicate Discoverer is in orbit, although there was doubt after it was launched.

Discoverer was the first in the series of ARPA-sponsored launchings of vehicles into polar orbits to obtain information on thrust capability, position stabilization for space vehicles, earth observation from space, and, eventually, the ability of animals to survive launch, orbital travel, and reentry. Vehicles are two-stage Thor-Ables, the 150,000-pound-thrust Douglas Thor as the first stage, and the 15,000-pound-thrust Bell Hustler as the second. Like Vanguard, Discoverer was a forerunner of far more sophisticated vehicles.

On March 3 the US, under NASA auspices, launched Pioneer IV, this country's answer to Mechta. Pioneer IV passed the moon the next day by a distance of 37,000 miles on its way into orbit around the sun. Although Pioneer IV, launched with the Army's four-stage Juno II, came months after the Russian Mechta achievement, it went the Russians one better by sending signals back to earth from a distance of some 400,000 miles, breaking Mechta's communications distance record of 370,000 miles.

The new asteroid also sent back what scientists called significant negative information—that there seemed to be no new radiation bands beyond the well-known Van Allen belts between here and the moon. If detailed examination of the radiation data bears out this preliminary data, it will be good news for interplanetary space travel.

In the inevitable comparisons with Russian achievements, it is true that the Pioneer payload weighed much less than Mechta's (Pioneer, 13.4 pounds; Mechta, 795 pounds). Also, the firing was not quite perfect. There was an error of angle and velocity which caused the Pioneer to pass the moon by too great a distance, invalidating an experiment whereby a light-sensitive device was to be triggered by the light of the moon. Also, the distance by which Pioneer passed the moon prevented its sending data as to whether the moon has a radiation belt around it.

The US and USSR, as they vie on the surface of the earth, now vie in the void. But there is little, if any, chance that Mechta and Pioneer will ever clash in space. Pioneer's eternal orbit around the sun will take 394¾ days. Its minimum distance from the sun will be 91,744,000 miles, and its maximum distance, 105,829,000 miles. It is not expected to get closer to earth than 5,000,000 miles nor ever to be seen by man again. Mechta, differing in orbit as well as ideology, now has a "neighbor."—END

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Civil space agency shows startling contrast to predecessor

NEAR Lafayette Square, across from the White House, where former President Harry Truman used to take those early morning constitutionals, sits a collection of elderly buildings marked with a bright new plaque identifying them as the headquarters of the National Aeronautics and Space Administration.

The relaxed outside appearance of the buildings belies the intense activity inside.

NASA, the nation's civilian space agency, less than a year old, is already deep in the business of managing the country's scientific space exploration program that began so modestly as the US contribution to the now completed International Geophysical Year in those quiet days before Sputnik.

With more than $335 million already committed to "in-house" and contracted aerospace research and development, a request for an additional $48 million pending in Congress, and forecasts of a half-billion-dollar budget request for FY '60, NASA is clearly emerging as a startling contrast to its predecessor agency, the old National Advisory Committee for Aeronautics (NACA).

The NACA was primarily an "in-house" operation, a low-budget service agency that supplied aeronautical research data to the military and to commercial and private aviation. Its successor—NASA—operating under a broad charter to *direct* all but "primarily military" space developments, is actively charting and managing aerospace programs ranging from weather satellites and superthrust rocket engines to deep space probes and manned spaceflight.

To perform these assignments, NASA is armed with broad contracting powers that make it, unlike its predecessor, a heavy buyer of research and development and an active coordinator of programs. NASA is clearly on its way to equal status with other older executive agencies of the government. It already compares in number of staff personnel with the staff of the Atomic Energy Commission, which has a complement of 6,790 people, although NASA's administrative total is much smaller, numbering in the hundreds. NASA has 8,000 people carried over from NACA, most of whom are researchers and laboratory personnel. AEC's FY '59 budget is more than $2 billion, which is much more than NASA's $335 million, but NASA officials are predicting that their space-exploration budgets will eventually run into the billions.

For a graphic chart of the facilities and key personnel of the NASA, spelling out activities of its laboratories, please turn to the following four pages of SPACE DIGEST.

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Chairman, National Aeronautics and Space Council
DWIGHT D. EISENHOWER

Chairman, Civilian-Military Liaison Committee
WILLIAM M. HOLADAY

Secretary, National Aeronautics and Space Council
FRANKLYN W. PHILLIPS

Secretary, Civilian-Military Liaison Committee
WILLIAM J. UNDERWOOD

NASA Administrator
T. KEITH GLENNAN

Deputy Administrator
HUGH L. DRYDEN

Secretary, NASA Inventions and Contributions Board
JAMES A. HOOTMAN

Assistant to the Administrator
JOHN F. VICTORY

Assistant to the Administrator
WESLEY L. HJORNEVIK

General Counsel
JOHN A. JOHNSON

Director, Program Planning and Evaluation
HOMER J. STEWART

Director of Public Information
WALTER T. BONNEY

Assistant Administrator for Congressional Relations
JAMES P. GLEASON

Director of International Programs
HENRY E. BILLINGSLEY

PROGRAMMING

Director of Business Administration
ALBERT F. SIEPERT

Director of Management Analysis
ALFRED S. HODGSON

Safety Officer
GEORGE D. McCAULEY

Director of Facilities Coordination
(Open)

Director of Aeronautical and Space Research
JOHN W. CROWLEY, JR.

Director of Spaceflight Development
ABE SILVERSTEIN

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Head of the Graduate School of Aeronautical Engineering
Cornell University
Secretary:
E. O. PEARSON, JR.

Committee on Aircraft Aerodynamics
Chairman:
R. RICHARD HEPPE
Manager of Advanced Aerodynamics Research
California Division of Lockheed Aircraft Corporation
Secretary:
ALBERT J. EVANS

Committee on Missile and Spacecraft Aerodynamics
Chairman:
DR. H. GUYFORD STEVER
Associate Dean of Engineering
Massachusetts Institute of Technology
Secretary:
RALPH W. MAY, JR.

Committee on Control, Guidance, and Navigation
Chairman:
DR. LOUIS N. RIDENOUR
Assistant General Manager of Research and Development
Missile Systems Division of Lockheed Aircraft Corporation
Secretary:
BERNARD MAGGIN

Committee on Chemical Energy Processes
Chairman:
JAMES A. REID
Executive Vice President and General Manager of Astrodyne, Inc.
Secretary:
HAROLD F. HIPSHER

Committee on Nuclear Energy Processes
Chairman:
DR. WALTER H. JORDAN
Assistant Director of the Oak Ridge National Laboratory
Union Carbide Nuclear Company
Secretary:
DAVID NOVIK

Committee on Mechanical Power Plant Systems
Chairman:
GORDON BANERIAN
Manager of the Turbo-Machinery Division
Aerojet-General Corporation
Secretary:
WILLIAM H. WOODWARD

Committee on Electrical Powerplant Systems
Chairman:
DR. KRAFFT A. EHRICKE
Assistant to the Technical Director of Convair-Astronautics a Division of General Dynamics Corporation
Secretary:
JAMES LAZAR

Committee on Structural Loads
Chairman:
E. Z. GRAY
Systems Engineering Director of Boeing Airplane Company
Secretary:
R. FABIAN GORANSON

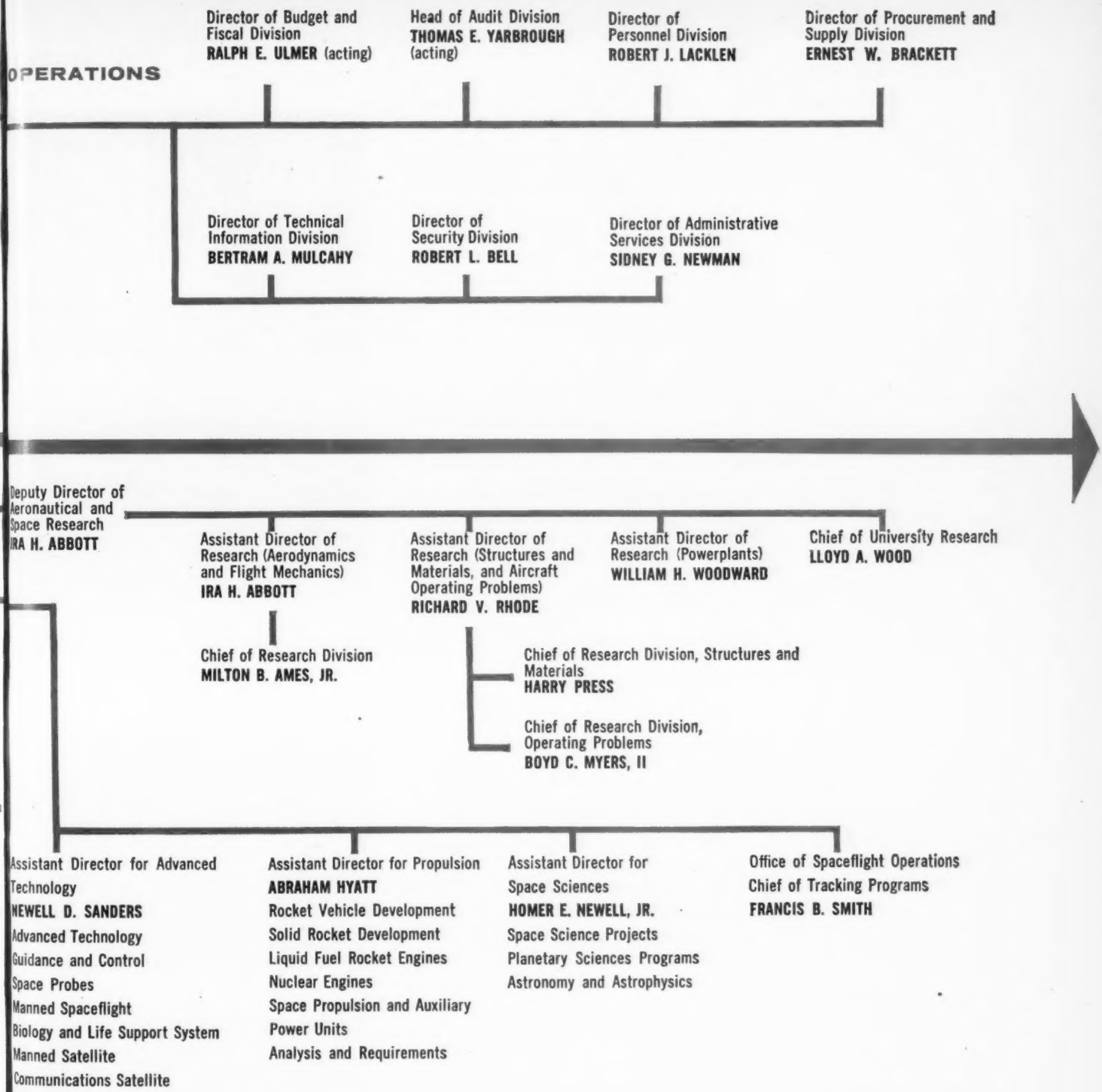
Committee on Structural Design
Chairman:
PROFESSOR E. E. SECHLER
Professor of Aeronautics
California Institute of Technology
Secretary:
MELVIN G. ROSCHE

Committee on Structural Dynamics
Chairman:
MARTIN GOLAND
Director of Southwest Research Institute
Secretary:
HARVEY H. BROWN

Committee on Materials
Chairman:
R. H. THIELEMANN
Senior Metallurgist
Stanford Research Institute
Secretary:
RICHARD H. RARING

Committee on Aircraft Operating Problems
Chairman:
WILLIAM LITTLEWOOD
Vice President of Equipment Research
American Airlines, Inc.
Secretary:
BOYD C. MYERS II

Special Committee on Life Sciences
DR. W. RANDOLPH LOVELACE II, Chairman
Advises NASA on matters connected with human factors, medical, and allied problems of the manned space vehicle program



THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

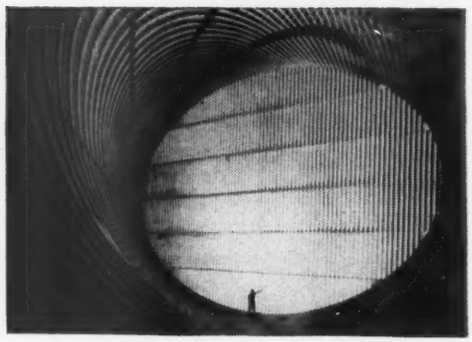
an AIR FORCE/SPACE DIGEST chart • March 15, 1959

RESEARCH

LANGLEY RESEARCH CENTER, Langley Field, Va.

HENRY J. E. REID, Director
FLOYD L. THOMPSON, Associate Director

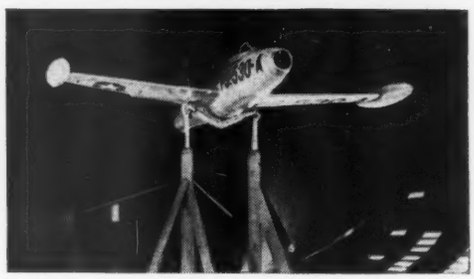
Temporary headquarters for Project Mercury program to put man into orbit. Oldest, largest NASA research center. Studies include structural aerodynamics with specialization in stability and control, flutter and vibration, aerodynamic loads, hydrodynamics, heating, VTOL. Located Langley AFB, Va., near Hampton, Va.



AMES RESEARCH CENTER, Moffett Field, Calif.

SMITH J. DeFRANCE, Director
JOHN F. PARSONS, Associate Director

Site of world's largest subsonic wind tunnel, several supersonic tunnels. Specializes in high-speed aerodynamics, extensions into space applications: as shock-tube experiments for reentry tests, particle acceleration, materials. Located Moffett Field, near San Francisco.

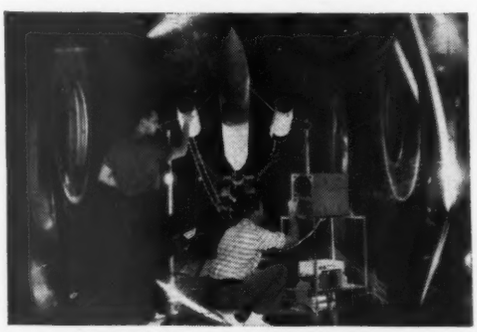


CENTERS

LEWIS RESEARCH CENTER, 21000 Brookpark Road, Cleveland 35, Ohio

EDWARD R. SHARP, Director
E. E. MANGANIELLO, Associate Director

Specializes in studies of propulsion for aero- and astronautical applications. Chemistry of fuels, operations of engines under simulated flight conditions, problems of combustion, lubrications, system structures, high-temperature materials, noise. Located Cleveland, Ohio, near municipal airport.



HIGH-SPEED FLIGHT STATION, Edwards, Calif.

WALTER C. WILLIAMS, Chief
DeELROY E. BEELER, Chief, Research Division

Site of research aircraft studies with emphasis on piloted flight. Location of much of X-15 program study, site of first piloted supersonic flight in Bell X-1. Located in Mojave Desert, northeast of Los Angeles, Calif., at the site of Edwards AFB, where X-15 pilots are being trained.

WESTERN COORDINATING OFFICE, Los Angeles, Calif.

EDWIN P. HARTMAN, Public Information Officer

DON MULHOLLAND, Assistant

ACTIVITIES

SPACE PROJECTS CENTERS

BELTSVILLE SPACE CENTER, Beltsville, Md.
(Open), Director
ROBERT R. GILRUTH, Associate Director
Projected site of NASA Space Projects Center, which will eventually serve as a center for theoretical and developmental studies in space technology, as well as Vanguard Division of NASA, developers of the NASA weather satellite. To be located just outside Washington, D. C.

- Assistant for Plant and Facilities Construction
  N. PHILIP MILLER
- Space Sciences Division
  JOHN W. TOWNSEND, Chief
- Theoretical Division
  ROBERT JASTROW, Chief
- Vanguard Division
  JOHN P. HAGEN, Chief

NASA PILOTLESS AIRCRAFT RESEARCH STATION, Wallops Island, Va.
ROBERT L. KREIGER, Engineer in Charge
High-altitude rockets with multistage rockets to study problems of stability and control by means of radar tracking, telemetry. Simulations of trajectory and reentry problems, with results applicable to later full-scale vehicles. Located Wallops Island, Va., not far from Langley.

JET PROPULSION LABORATORY (Cal Tech Contract), Pasadena, Calif.
WILLIAM H. PICKERING, Director
Specializes in space electronics, communications, propellant development, guidance for space vehicles. Operated by the California Institute of Technology under contract to NASA. Complement of 2,300 Cal Tech-provided personnel. Located in upper Arroyo Seco, near Pasadena, Calif.

CAPE CANAVERAL, Cape Canaveral, Fla.
MILTON GOUGH, Liaison Officer
Air Force Missile Test Center, site of east-west launches of space-probe vehicles such as lunar and solar Pioneer series under NASA auspices. NASA liaison office. Located on east coast of Florida, near the city of Cocoa Beach.

NASA Lewis Research Center
Propulsion Laboratory
Cleveland, Ohio
Beltsville Space Center, Beltsville, Md.
NASA Headquarters, Washington, D. C.
NASA Pilotless Aircraft Research Station, Wallops Island, Va.
NASA Langley Research Center, Langley Field, Va.
Cape Canaveral, Cape Canaveral, Fla.
NASA Ames Research Center, Moffett Field, Calif.
Jet Propulsion Laboratory, Pasadena, Calif.
NASA High-Speed Flight Station, Edwards, Calif.

In the six months of its operating existence, NASA has awarded—just for its two present major programs—contracts to industry totaling more than a quarter of the entire $100 million budgeted for the old NACA in its last year of operation. These are the $10 million to North American Aviation's Rocketdyne Division for development of a single-chamber, million-pound-thrust engine, and the $18 million to the McDonnell Aircraft Corporation for supply of twelve space capsules within the next fourteen months, to be used in NASA's Project Mercury program to place a US airman into orbit.

This $28 million total, representing only the beginnings of the two programs, is in turn but a small portion of the grand total of NASA contracts now in force. NASA has assigned large sums to such agencies as the Air Force Ballistic Missile Division, the Naval Research Laboratory, and the Army Ballistic Missile Agency, for such items as study and development of Mars and Venus probes, continuing weather satellite programs, and superthrust engines. Some of the plans are so "far out" in terms of today's state of the art that little more than speculation is possible. In addition, NASA will be operating, by contract with laboratories and, in some cases, foreign governments, the tracking network that is so vital to space-probe experiments, plus a heavy schedule of contracted exploratory research in universities and foundations. Recommending lines of research are such agencies as the National Academy of Sciences.

To run its expanded research and development programs, NASA has at its disposal the personnel and facilities it took over from the old NACA. These include (*see NASA charts, pages 90-93*) five field laboratories, which by the time of Sputnik were already increasingly involved in space research problems—superspeeds, superfuels, reentry, etc.—and the approximately 8,000 technical and administrative people who had worked for NACA. Added to these are the 2,300 people of the Jet Propulsion Laboratory near Pasadena, Calif., and the 200 transferred from what was the Navy's Vanguard Project. The latter group, under the direction of Dr. John Hagen, now forms the Vanguard Division of NASA and managed the successful launching in February of the Vanguard weather satellite (*see page 86*).

In the planning stage is a new NASA center at Beltsville, Md., near Washington. Beltsville will be the center for many of NASA's "in-house" space studies.

By June 1960, NASA, which now has to compete on the open market for technical skill (much more than did the lower-budgeted NACA), hopes to have a 10,000-man complement, in addition to the 2,300 people at JPL.

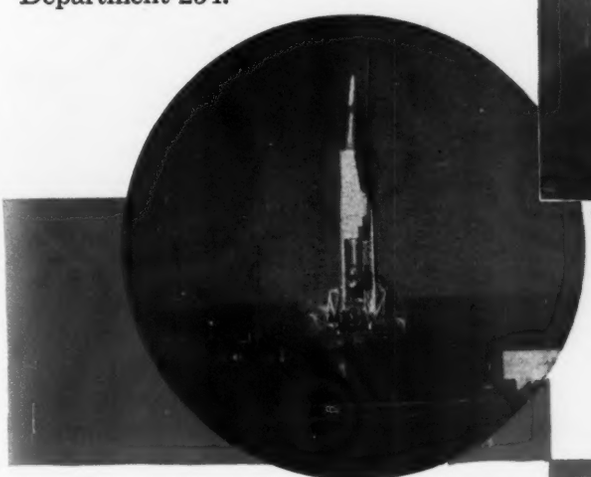
Although NASA is now a large-scale buying and planning operation, its old-style "in-house" aeronautical research continues. This is a fact often lost sight of in the face of increasing stress on space technology. Of course, aeronautical and astronautical technology get close to being the same thing as speeds and stresses increase. And eventually most of the pressing *aeronautical* problems will be solved, allowing NASA laboratories to concentrate on purely space technology.

It is interesting to note that NASA, in its role

KOLLMORGEN Instruments and Systems for missile launching observation

Here are two different Kollmorgen products designed for the missiles field. One is a remote viewing device, the other is used for acquisition and tracking. These are essentially optical instruments, but most Kollmorgen products also include electronic controls and components. Kollmorgen specializes in design and manufacture of a variety of highly precise instruments and systems for both industrial and defense viewing and inspection applications.

We have recently prepared a twenty-four page illustrated brochure which describes our facilities and primary fields of interest. For a copy, please write to Department 254.

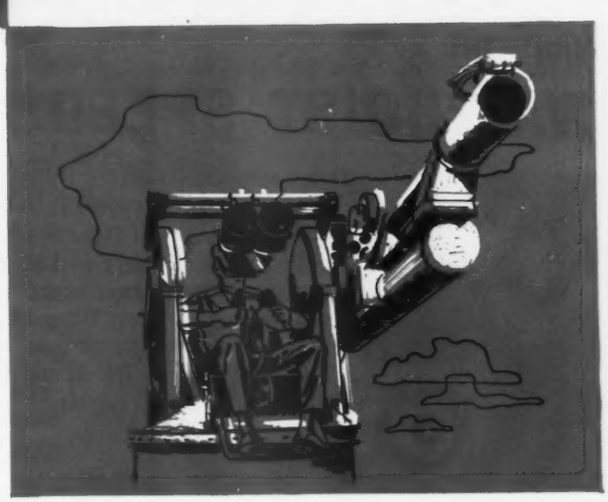


Official USAF photos

At Cape Canaveral, remote viewing of missile firing and static tests is accomplished with Kollmorgen bunker-type periscopes. Bunkerscopes have varying degrees of magnification, show images in true color and allow detailed observation of hazardous operations with no danger to personnel. The photograph at left was taken through a Bunkerscope at low power. For close-up observation and photography, the high power range brings the subject many times closer. Bunkerscopes are easy to operate, need no special care.

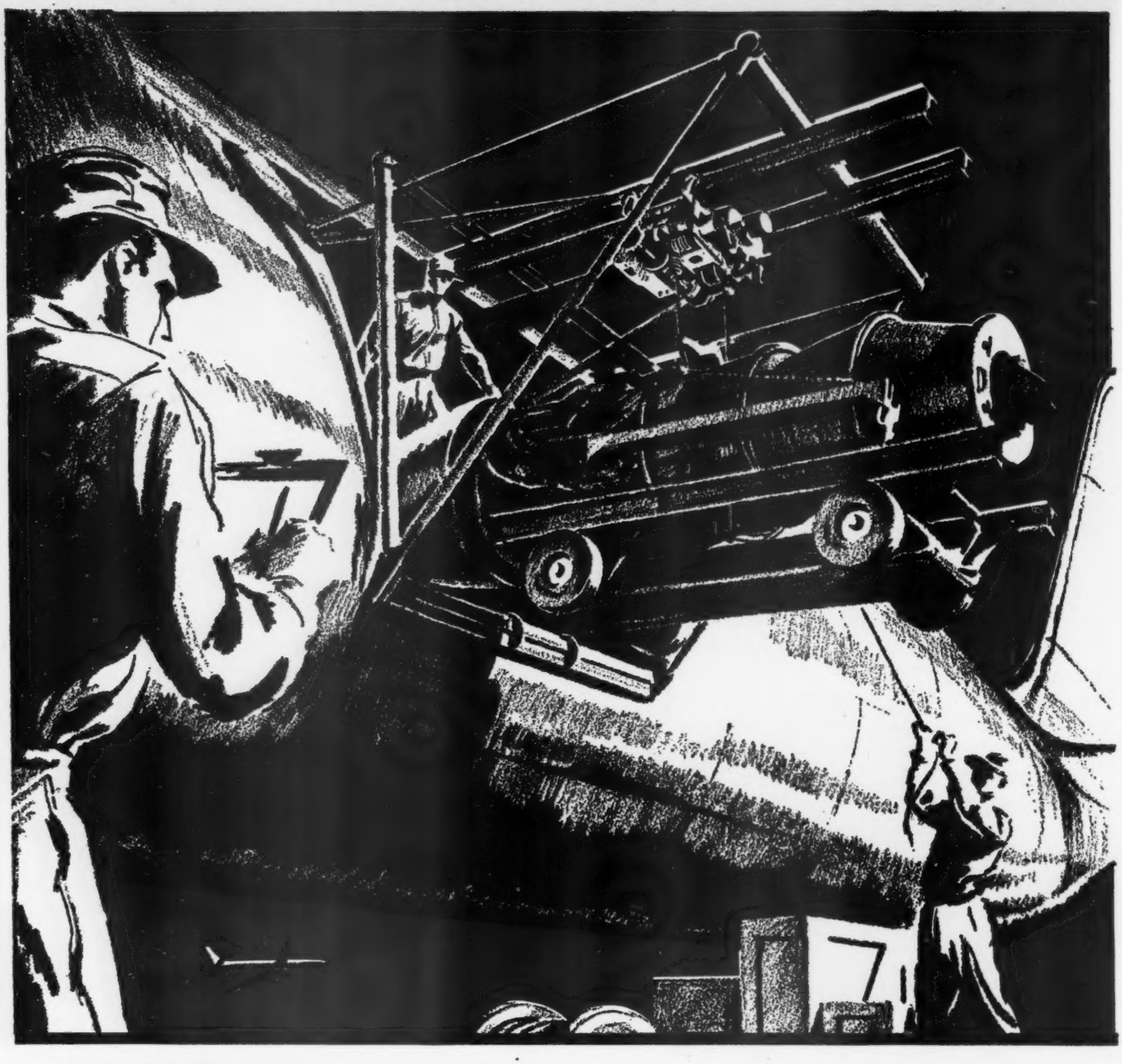
for missile tracking

Adapted from a basic Kollmorgen design, Missile Tracking Binoculars form an integral part of an acquisition and photography system which records the performance of tactical air-to-air missiles at China Lake Naval Ordnance Testing Station. These high-power, wide-field instruments enable an operator to spot and track a missile from before the time it is fired until it reaches its designated target.



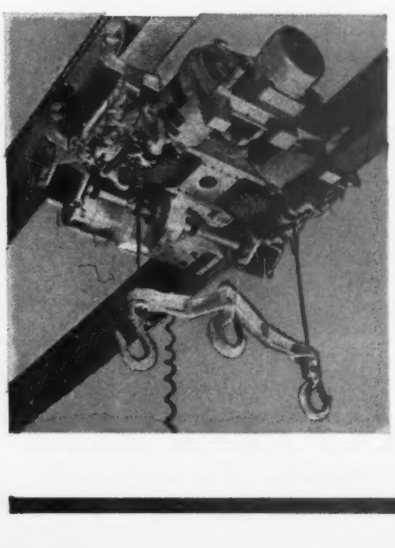
KOC

KOLLMORGEN
optical corporation
NORTHAMPTON, MASSACHUSETTS



HIGH SPEED HANDLING

FLY-AWAY HOIST SPEEDS JET TRANSPORT



This compact, powerful fly-away hoist for the KC-135 lifts an 8,000 lb. load at 10 or 20 fpm . . . moves it in the plane at 20 or 40 fpm.

Typical of WESTERN DESIGN'S 13 years' specialized experience in aircraft cargo hoisting, transversing and airline baggage lifting, the KC-135 hoist is one of many systems designed and produced for applications which include helicopter rescue, sonar hoisting, litter lifting, bomb and missile loading, fuel hose retraction, and delicate instrument handling. The DC-8, 707, KC-135, B-52, C-124, KC-97, C-47, C-46, DC-6, and RC-121 are equipped by WESTERN DESIGN.

For any cargo hoist requirement, ground or air, call WESTERN DESIGN.

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as manager, buyer, and user of research and development, has a new, almost "turnabout" relationship with the military and industry, as compared with the old NACA. The missile agencies of Air Force and Army now act as "executive agents" of NASA for such projects as space probes, with NASA assigning sums to Air Force's BMD (or ABMA, or NRL) which in turn buys the industry or university skills that help put the projects on the road. Also, NASA's role as the primary news outlet on scientific space experiments is significant.

The reason for NASA's utilization of the military capabilities—both in actual launch operations and in the research and development field—is twofold. First, in the act creating NASA Congress stressed its intent that existing facilities be used by the space agency. And, second, as a practical matter the missile-launching sites—Cape Canaveral in Florida and Vandenberg AFB, Calif.—are already built and are operated by the Air Force. Perhaps, later in its development, NASA will, in particular situations, operate its own space launch pads at existing military sites or on sites to be built for its own use.

For the most part, NASA is on a par with the Department of Defense so far as contracting rights are concerned. But there are some differences which NASA is seeking to eliminate.

NASA at present does not have the right, as does DoD, to indemnify contractors against unusual risks that might occur in the course of a contract. Also the space agency does not have authority to guarantee loans to contractors, as DoD does. In the "new-discovery" area, NASA is required at present to review discoveries made while a contract is in force to determine if patent rights should go exclusively to the government. DoD, operating under a slightly different set of ground rules (acquiring a royalty-free license), does not have this requirement. NASA legal experts believe that these differences from DoD's procedures put NASA at a slight disadvantage in negotiating contracts. The agency is seeking changes to put its contracting procedures in line with DoD. NASA does, however, operate its procurement under the same regulations as the military services.

Like all government agencies, NASA has to operate under the law. And even with its broad charter, it still carries on its back the basic problem that plagues all the contributors to the national space effort: the question of who is to do what.

NASA is charged with management of the *civilian side* of space development. The law makes a rather hazy separation between "civilian" and "military" space operations—a distinction which is difficult to justify in the face of reality. Decisions on who is to do what are, according to the law, supposed to be up to the President, advised by the National Aeronautics and Space Council. The President is expected to determine whether the military or NASA is to run a particular project, if the question gets heated enough and hasn't been worked out on lower levels (such as the liaison committee, chaired by William T. Holaday) between NASA and DoD.

But how can anyone say absolutely that a weather satellite is purely a scientific experiment? Or conversely, how can anyone say that today's missiles will not someday have primary use as civil transports?

The NASA, in its brief existence, has shown dynamic qualities and has come to represent a sharper focus for the space effort. But it is not *the* top space agency, for the simple reason that there is *no top* agency under the present ground rules—nor is anyone sure that a top agency is the answer (*See "The National Space Effort," February '59* SPACE DIGEST).

Under the aggressive leadership of T. Keith Glennan, NASA is operating at full steam. Some of that steam was evident in the rapidity with which NASA asked for bids, examined them, and awarded contracts for the million-pound-thrust engine and the Project Mercury capsules. The procedures took weeks—not months.

Another significant service NASA, in its young life, has performed is bringing together, under one basic management roof, talents like the Pickering team at JPL and the Von Braun group at Huntsville, Ala. Today, under the NASA aegis, a variety of agencies can devote full energy to the space effort.

Also NASA has thus far refrained from building a "start-from-scratch" space medical operation, recognizing that the long-time experience of the Air Force, and to a lesser but important degree, the Navy, is readily available. Instead of building an empire of its own in the medical area, NASA has set up a group of experts representing all the military medical teams—people who know what the military can supply on the medical side and who are in a position to recommend for NASA's approval programs that are realistic.

NACA would barely recognize its space-age offspring.—END

Putting a Solid Foundation Under the 'Ivory Tower'

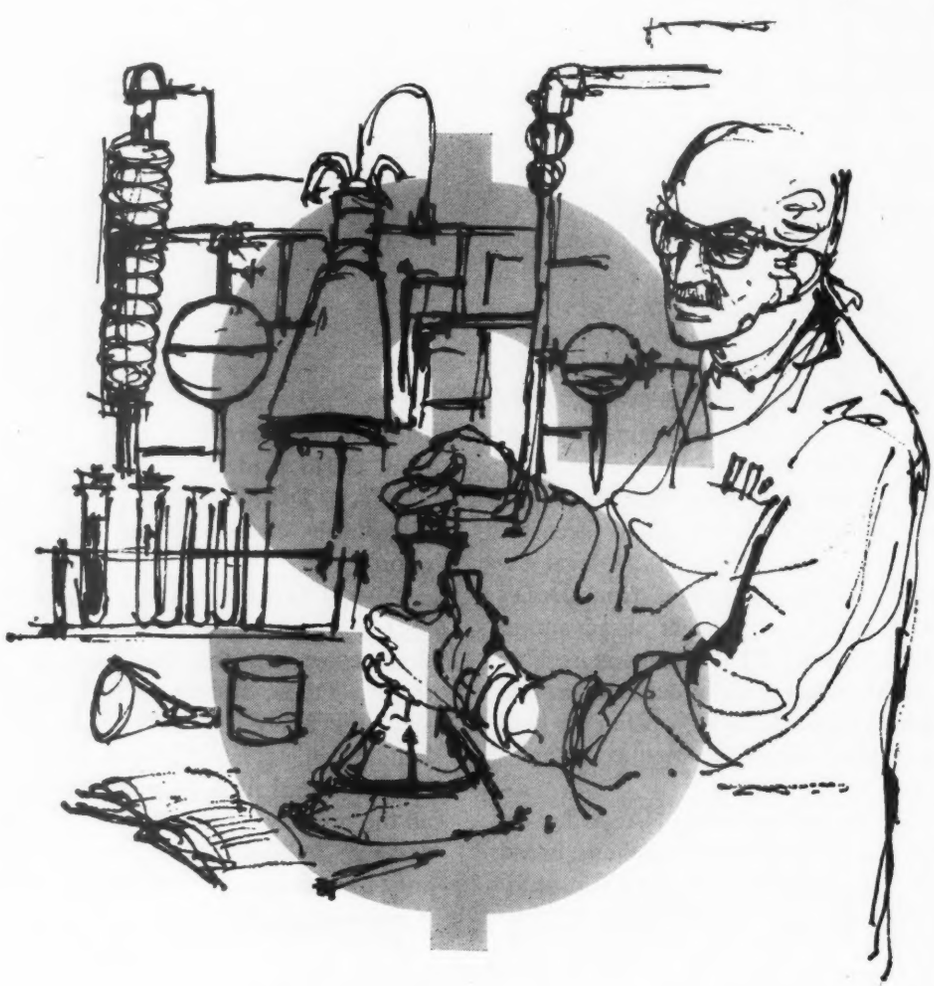
Government-sponsored university research presents increasing problems for the inquiring mind. A scientist spells some of them out here

LAWRENCE H. O'NEILL

THE multiplication of government-sponsored research laboratories in American universities is one of the striking facts of modern academic life. In a bumper year, fiscal 1957, the United States government agreed to provide $384 million for the support of scientific research in or connected with educational institutions. Almost seventy percent of these government funds were provided by the Department of Defense and the Atomic Energy Commission.

Although everyone knows that much useful research goes begging for support, it's clear from these figures that federal funds are a mainstay of academic research in our time. Research holding promise of some military application occupies a sizable number of scientists and engineers in American colleges and universities. Inevitably, financial support in such an amount must forcibly affect not only the work it pays for but, indeed, the pedagogical and other intellectual affairs of the institutions receiving it.

This almost total financial dependence of university researchers on military and other national



See ITT Exhibit at "World Congress of Flight"

FROM INTER-OFFICE TO OUTER SPACE...

The telephone rings. You lift it and talk to an associate in the next office.

A countdown reaches zero at Cape Canaveral. Minutes later a new satellite radios its position . . . in orbit a hemisphere away.

One of these events is today commonplace . . . the other, still spectacular. To the 130,000 men and women of International Telephone and Telegraph Corporation, both are episodes in a never-ending drama called *communications*.

It means many things

At ITT communications is submarine cable, radio-telegraph, microwaves beamed over valleys and seas. At the world's great airports, it is the Instrument Landing System. It is TACAN and VORTAC, electronic air-navigation safety aids for civil and military flying.

Communications is guidance systems for rockets and missiles. It is over-the-horizon TV. It is the technical training and manpower ITT provides for the Distant Early Warning (DEW) Line in the Arctic. It is a new, world-wide control system for the Strategic Air Command.

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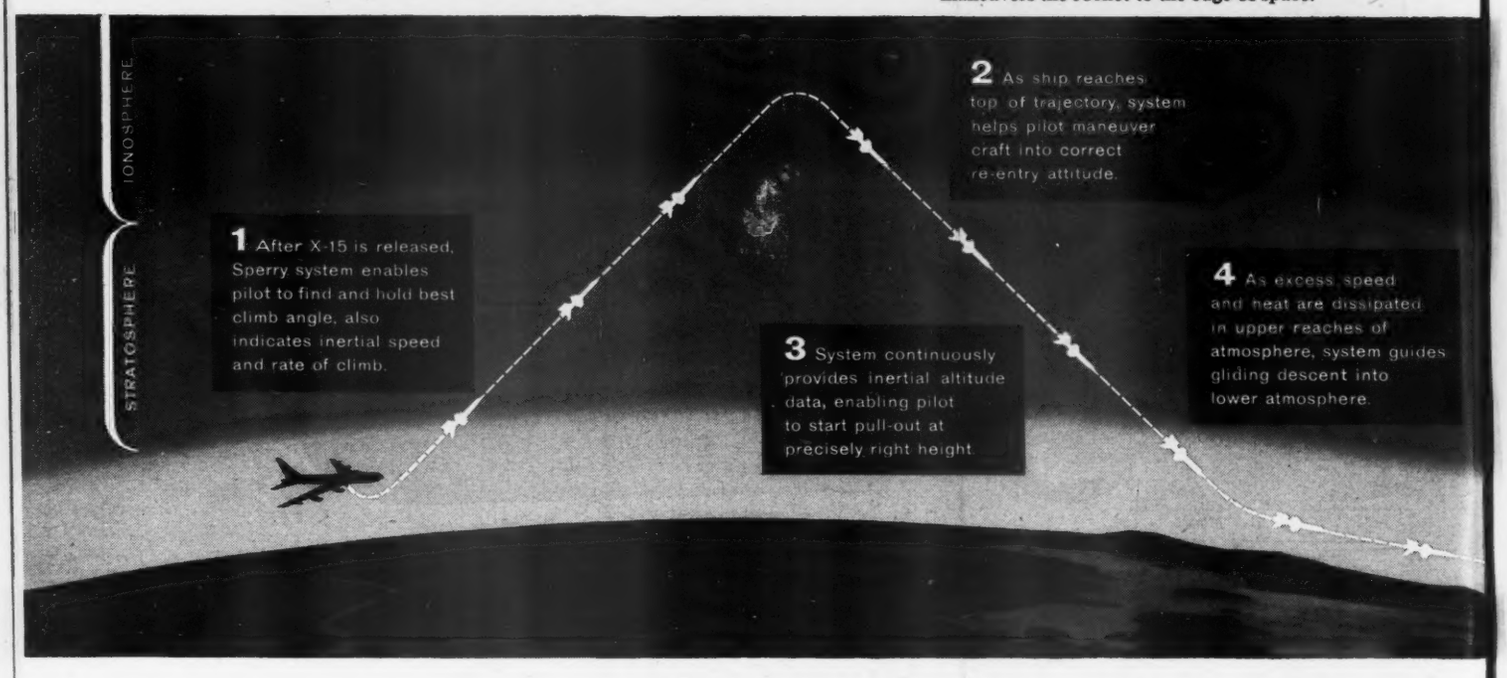
IONOSPHERE
STRATOSPHERE
1 After X-15 is released, Sperry system enables pilot to find and hold best climb angle, also indicates inertial speed and rate of climb.
2 As ship reaches top of trajectory, system helps pilot maneuver craft into correct re-entry attitude.
3 System continuously provides inertial altitude data, enabling pilot to start pull-out at precisely right height.
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security agencies has concerned academic people a good deal recently—they are concerned that the independence of faculties and their schools may be unfavorably affected by such things as security restrictions on open publication of research results, the nonintellectual requirements imposed on researchers by clearance procedures, and the diversion of labs, men, time, space—and even money—from instructional uses. There is, in fact, a growing and understandable desire on the part of many academicians to *avoid* risky ventures involving federal support, to forego them entirely. How they may be risky we shall see presently.

But abstaining from research projects which might be harmful to other academic pursuits is not, unfortunately, always possible. There is no obvious dividing line between projects which may be called appropriate or inappropriate to a university. This is implied by the prolonged failure of scholars to converge on a definition of "basic" research. Not only are there differences from one discipline to another in what is viewed as fundamental, but there is frequently no common opinion on the matter within one field. Broad, searching investigations seeking knowledge for its own sake and those striving to achieve "practical," describable ends have a way of meeting and crossing. The artificial satellites were launched by very practical techniques. Their orbiting motions are in accordance with mathematical descriptions formulated three centuries ago. Nevertheless, they are revealing to us much that we had never known before about the region beyond our atmosphere.

The vast increase in magnitude and complexity of university research programs (almost all supported by the federal government) and the consequent alteration in the quiet, reflective atmosphere that has usually surrounded and fertilized university research have deeply disturbed many scholars. For one thing, there is a justified fear that the lone inquirer, working without ostentation or the sponsorship of the AEC, will suffer in comparative prestige and recognition even within the universities. On the other hand, R. G. Folsom, in a recent article in *American Scientist,* calls attention to the changing methods of science itself:

"Over a long period of years it was possible in the physical sciences for a single individual to make significant contributions to knowledge with bailing wire, sealing wax, and wood, or even with just paper and pencil. [Now] in many areas of engineering and the physical sciences, the phenomena studied are so complicated that the individual is frequently seriously handicapped [by a] lack of knowledge in specific areas or of expensive and complex equipment. In such cases the research is done by a competent team. A measure of the trend toward team approach is the increasing number of technical publications with multiple authors. The academic institution, to have [a] staff engaged in significant research, must seek outside support because available funds for such purposes are generally inadequate."

It appears, then, that if the universities are to be effective participants in the great scientific and technological explosion which Columbia's Charles Frankel calls "the third great revolution of mankind" [*see* SPACE DIGEST, *February, 1959*] and if they are also to preserve and protect the detachment of the individual, which is the central academic asset, they must learn to walk with great wisdom among hazards of a kind they have never known before. As Henry Kissinger commented in a recent book, "Nostalgia for a more secure and less cataclysmic past is understandable. But facts cannot be changed; they can only be used."

Somehow, more consistent ways must be found to sustain the vast and important inquiries which can only be supported by the federal government —without trampling underfoot those whose contributions to knowledge must come out of quiet meditation. There is no intrinsic conflict between these two kinds of scholarship. But ill-advised government policies controlling research support can create one. For this reason it is imperative that universities themselves follow well-considered policies in *accepting* government research support. . . .

In the hand-wringing days after Sputnik, the United States seemed to experience a sort of titanic New Year's Day as Americans determined to "improve." We were to turn from past folly in education and research. Never again were we to place automotive luxury above good schools. The release of intellectuals, en masse, from the doghouse was to take place forthwith. Science, especially basic science, was to be given its head. Woe to that bureaucrat or budgeteer who got in the way.

In those few weeks university people experienced—and expressed—feelings of triumph because the importance of the intellectual had at last been so clearly demonstrated. Mixed with this was their fear that demands would arise for an erroneously or too narrowly defined kind of scholarship. Many hastened to point out that the successful launching of a satellite was not an achievement in basic science. Others cautioned that civ-

ilized life could not subsist on science alone.

Now, a year later, it is apparent that both triumph and fear were premature. Nothing much has really happened in the aftermath of Sputnik. To be sure, there has been a certain amount of organizational reshuffling, and some projected federal budget cuts (estimated at about $5 billion) have not been made. But surely nothing like a great national effort to achieve unmistakable scientific and technical leadership has been set in motion. The responsibility for this falls mainly upon those officials of government who are supposed to provide at least political leadership to the nation.

But the academic community also has much to account for. When the American people were stunned by the discovery that their neglect of intellectualism in technology had cost a great price, university people also failed to agree among themselves upon how the nation should respond to Sputnik—upon what should be done, and how. As a result, much of the post-Sputnik comment originating in learned circles came to be viewed as mere self-righteousness, as opportunism, as an attempt to exploit a national humiliation for narrow, selfish purposes. This is the opinion one runs across among at least some government officials responsible for the procurement of research services.

Where do the difficulties begin?

It is understandable that the armed forces, in commissioning research, view it as a means through which they will be better able to discharge *their* assigned missions. Regardless of how laudable the purposes of a projected research program may seem to the scientific community, irrespective of how sensible a decision within a research effort may appear to be, those responsible for administering government support of such work are obligated to base their official actions on an honest estimate of how well the work serves the purposes of *their agency*. This is, of course, the central obstacle to harmony between the university view of research and the military view. When an agency's objectives in research are matched to those of the university, all major conflict disappears. Such has been the happy case with a number of research contracts granted by the Office of Naval Research, the US Army Office of Ordnance Research, and the US Air Force Office of Scientific Research—contracts amounting to agreement to support the research of a professor and his students with only the very broadest specification as to what the research shall be. For example, one Columbia research contract states simply that research into the general subject of "elasticity" shall be conducted within a wide range of instances —but that the allowable areas of inquiry "shall not be limited to these."

But many kinds of research require a good deal of time, great numbers of mature workers, and enormous expenditures for equipment. In some cases, even small projects require the use of facilities that could never be fully supported on university budgets alone—the use of a large computer, for instance, to carry out calculations that would be prohibitively long or laborious without special equipment. The typical charge to lease a modest computer is about $60,000 a year. Add to this substantial costs for the salaries of a maintenance and an operating staff. Obviously, a small contract intended primarily to pay the half-time salary of a professor and two or three research assistants could never sustain more than a small fraction of the cost of such a facility. Unless the computer can be largely supported on funds obtained through large contracts, the alternative is to do without the computer or to pay for the occasional use of a commercial service, with all inevitable formalities and delays.

To understand the scope and complication of some of the research now going on in American universities under government sponsorship, we might consider a not altogether exceptional project in electrical engineering at Columbia: A radar project now being pursued there requires advanced work in the techniques for generating a radar signal of carefully controlled characteristics, a much improved technique for receiving it when it returns, a major increase in the speed with which computers can describe the returning signal, and a fundamental investigation of the properties of certain types of radar components. The latter inquiry alone requires expert work not only in electronics but also in mechanics. In addition to the work I have described, psychologists are studying certain interpretation capabilities of human beings as a part of the same vast project.

Many people are needed to treat such a wide

ATLAS

The myth and the missile

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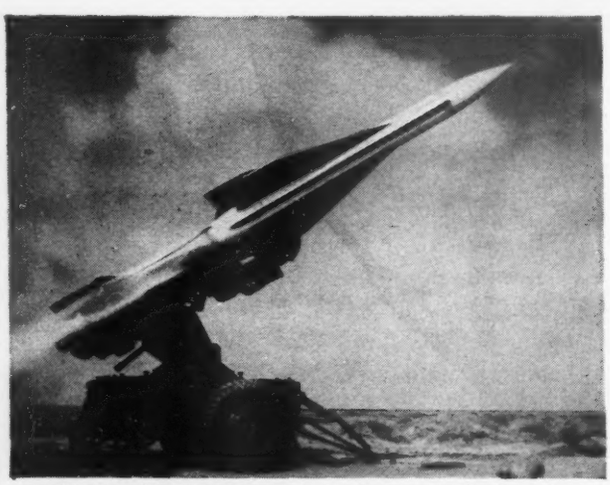

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range of problems and to maintain an adequate flow of information, judgments, and suggestions throughout the research staff. Many aspects of this project require experimental study or the verification of theoretical predictions. This, in turn, means that large laboratory facilities and even more supporting staff members are needed. One experimental study involves transmitting signals northward and observing the detailed properties of reflections from the aurora borealis. Merely to do this, it is necessary for Columbia to employ the complete facilities of the Edwin H. Armstrong Laboratory at Alpine, N. J.—and to employ men to run it.

Any large project, even when its major goals are quite practical, if it is worthy of a place in a university, uncovers all sorts of fundamental scientific problems. It is proper, necessary, and entirely practical to lift such subproblems out of the main stream of a large project and set them aside for independent study. History is so rich with cases in which the ancillary results of research proved to be the ones of enduring importance that failure to pursue fundamental questions when they arise can only be viewed as maldirection of the work. In just this manner, then, every good research laboratory develops a list of enticing investigations that might be carried out but for which staff and facilities are not at the moment available. It is largely from these that the research programs of the future are built.

But under typical military procurement procedures, no responsibility is assumed by the government for the continuity of a research laboratory. Contracts usually offer one-year terms with no commitment that support will be provided beyond the contract term. There may be—and usually is—an informal understanding that no sudden termination of support will occur. Or not if the agency with whom one is dealing can *prevent* it. But the fact is likely to be that that agency cannot itself give final assurance that funds will be available after higher headquarters, review committees, and officials having no personal contact with the work make up *their* minds.

Funds, including those used to support research, are authorized and appropriated annually by Congress. Thus, in a real sense, the Department of Defense at least shares the annual uncertainty of its university research contractors. There is a complete separation between the government officials responsible for maintaining and understanding research and those with financial and legal control over research contracts. Add to this the fact that large-scale research support must be justified in the light of the current military purposes of the armed forces.

Good university research laboratories are built slowly and painfully over years. Irrespective of the fate of its work, a significant national asset is lost when a research group disperses because money to support it could not be provided in time. It is neither fair nor reasonable to expect universities, with their already strained finances, to "carry" a large and expensive organization while awaiting the uncertain outcome of a cumbersome government procedure. Nevertheless, during the days in late 1957 when the Air Force was struggling to hold its expenses within authorized limits, many universities, including Columbia, were asked to continue research programs but to delay their claims for reimbursement for painful lengths of time. In such a situation the procurement regulation that refuses to recognize interest on borrowed money (borrowed by a university to sustain a laboratory) as a reimbursible cost is a sort of last ignominy.

To be sure, Congress does make available funds that can be committed for terms longer than one year. But the practical fact is that, faced by annual budgetary uncertainty, the armed services, who distribute much of the money, always attempt to limit the duration of their own commitments in order to be able to accommodate themselves in a budgetary crisis. Unless Congress acts to the contrary, the armed services will continue to retain the freedom to decide which laboratory survives and which dies on the basis of program priorities at the time a budgetary crisis occurs. This by no means assures that the most valuable laboratories will survive. Military priority and scientific necessity are not identical—in anyone's mind.

The separation of scientific knowledge and financial responsibility is fundamental to government organization in these matters. But so long as financial decisions are made by officials whose only obligation is to assure the financial cleanliness of a contract and who have no responsibility whatever for the scientific results produced under the contract, we may expect that almost all finan-

cial and administrative decisions will be made in a way that affords maximum protection to the official making the decision. Since the government seeks to obtain the best possible research work, this arrangement can be damaging both to scientists and to the government.

To be sure, I have known contracting officers who showed far greater zeal than their scientific counterparts in the government service for obtaining the best possible research return. However, it hardly seems fair to expect such men, trained as they are in finance rather than science, to make judgments involving subjects for which they have no extensive background.

The policy of justifying research projects by an estimate of their utility in meeting military objectives raises a fundamental issue: whether military objectives as perceived and defined by military authorities are an effective guide to the best military return from research. The needs of an automobile purchaser are not synonymous with talent as an automobile designer or production expert; it may well be that the need of the military for the fruits of research does not amount to an adequate qualification to direct that research.

It may be argued that it is precisely the responsibility and right of the armed services to define the military hazards for which we must prepare. Conceding this is not at all the same as conceding that control of research must be in military hands. It is perfectly clear that neither a military hazard nor an effective means of meeting it can be described until scientific knowledge and technical art have told all of the possibilities.

The trouble with research dominated by its user is that it tends so strongly to view possibilities in the light of present certain knowledge. It is restless and impatient under the pressure of present needs, and the temptation is very great to put off until a less anxious time the work on which no payoff can be guaranteed.

On the other hand, the problems of national security are real. The very lives of the people of the United States are at stake, together with moral, political, and social values evolved in pain over many centuries. It is unreasonable to expect that scientists and engineers will be permitted to go their way in research as if the nation were not seriously threatened. Researchers must certainly rank their obligations as citizens before mere professional preferences.

This does *not* mean that fundamental research should be pushed aside to make way for applied science, nor does it mean that the military forces should continue to control the major part of research. It does mean that researchers should show a respect for the opinions of their fellow men, and take the trouble to explain why many things that look like intellectual fiddle-faddle—even when they sometimes turn out to *be* intellectual fiddle-faddle—must be tolerated to bring about the advances in knowledge upon which our safety and happiness so importantly depend. Just as our system of justice accepts the risk that some of the guilty will go unpunished in order to be as certain as possible that no innocent person will be unjustly punished, so we must accept a certain amount of intellectual backing and filling in order to be as certain as we can be that the brilliant mind whose notions strike less imaginative men as useless is not suppressed.

Military control of research doesn't necessarily lead to intolerance and enforce the narrow view. But it is apt to. Every good soldier accepts the ultimate authority of the established order and the formal rules. It is the business of the researcher to be irreverent, to be over curious, to wonder if things are as authority says they are, to wonder if the things could be better, and to say so if he is convinced he is right. It could well be that there is a basic psychological incompatability between the mind that accepts and respects military tradition and the skeptical scholar's mind.

We have long since passed the point where a clear separation could be drawn between civilian and military functions in building the nation's strength. A university engaged in the training of students and the accumulation of knowledge through research is an instrument for national security in quite as full and direct a sense as an Army division or an Air Force wing. We should stop "purchasing" university research under a . . . set of rules only slightly different from those we use in buying trucks, tanks, and airplanes.—END

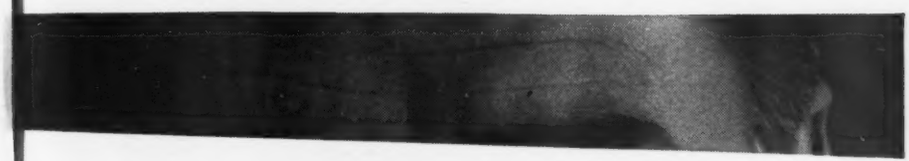
Professor of electrical engineering at Columbia University, Lawrence H. O'Neill has been active in research programs for military developments since he received his degree at Columbia's School of Engineering in 1943. He is the director of Columbia's Electronics Research Laboratories and serves as a consultant at the White Sands missile range. This article is reprinted with permission from the Columbia University Forum, *and with permission of the author.*

progress report on Aeronutronic

MEN

WITH

OPEN



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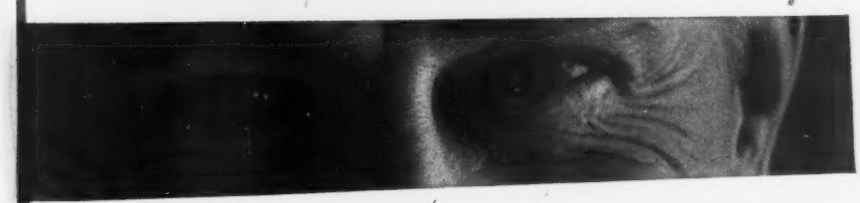

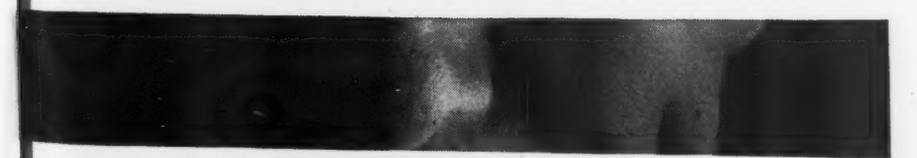

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When you're weightless, you've got to have something to hang onto, as the airman on the opposite page has discovered. He's floating inside a USAF C-131 B aircraft.

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A Newtonian Nuisance . . .

THE WEIRD WORLD OF WEIGHTLESSNESS

WILLIAM LEAVITT
Associate Editor

OF ALL the eerie conditions the space traveler will have to face when he leaves this world for a brief foray into orbit —or a trip to Mars—weightlessness will be the strangest.

The word itself is strange. How can anything be weightless? Even the "lightest" objects—feathers, a strand of hair, and the like—have measurable weight, if you put them on a delicate scale. And, if you had a scale small enough and sensitive enough, you could weigh a germ.

But it is an astronautical fact of life that a spaceman in his sealed cabin, once his ship's propulsion is cut off, will—if unrestrained—be able to float in midair in his ship without the slightest danger of falling down. In fact, there will be no "down" or "up" in the ship. And if you could set the spaceman on a scale, it would read zero. Similarly, if you put the *scale* on a scale, it would be weightless too, *ad infinitum*.

This seemingly illogical situation becomes quite logical when you remember that the universe we live in is made up of things whose characteristics are measured in relation to each other. Weight is only the measure of the gravitational attraction of

Slightest force propels airman out of reach of task device as he sits on the "frictionless platform" at the Wright Aero Medical Laboratory, Dayton, Ohio.

the earth on the mass of any object on or near the planet.

This relationship is occasionally altered. When you are thrown forward by the sudden stop of a vehicle, your weight increases, the amount depending on the force of the impact, the suddenness of the stop. Air Force Col. John P. Stapp has sustained up to forty-five times the normal force of gravity in rocket-sled deceleration tests. At the instant of greatest deceleration, Colonel Stapp weighed forty-five times as much as normal.

When the relationship of gravitational force upon mass is altered in the opposite direction, you can experience fractional G, the ultimate of which is weightlessness—that is, zero-G. If you jump up into the air, the instant you stop rising but have not yet started falling you are virtually without weight. And everyone has experienced the sensation of fractional or "negative" G when a fast elevator "drops out from under" him.

Mass is the reality involved in weight or weightlessness, and mass is simply the sum total of the atomic and subatomic particles that make up you or me or a feather or a germ. It is the totality of these particles that is acted on by gravity to create the condition we call weight.

Weightlessness, then, occurs when the gravitational attraction on mass is effectively canceled out. This is true of objects in orbit, since the gravitational attraction of the earth is exactly counterbalanced by the centrifugal force of the vehicle as it rushes along its path. Although earth's gravity is constantly trying to pull the vehicle down, the velocity of the vehicle is sufficient to keep the vehicle up. With gravity counterbalanced, the vehicle, and its contents, are without weight.

It is important to note at this point that the elimination of weight has no effect on the *mass* of the object. If you happened to be working outside a spaceship and were caught between the outside wall of your ship and a heavy piece of space hardware that a fellow spaceman had pushed at you, you would be quite badly banged up, crushed if the mass of the object and its speed were sufficient. This is a point that is seldom brought out in drawings of spacecrews effortlessly moving components around in the void.

Beyond orbital flight—en route to the moon or planets—weightlessness would obtain too, because of the limitations of today's chemical fuel systems for rockets. To reach the moon or planets in the only way possible with today's propulsion systems, you must create sufficient thrust to cast the ship beyond the dominance of the earth's gravity and then let it "fall" in a great curve toward the orbit and gravitational attraction of the moon or target planet.

During this period of "free fall," after the spaceship's power shuts off, the vehicle and its contents are weightless. It is true that, if a steady and fairly powerful propulsion system were in use throughout the journey, a kind of "artificial gravity" *would operate,* pulling the occupants toward the ship's exhaust. This would give space travelers a workable "down" and sensation of weight, caused by the downward pull. But such steady inflight propulsion is only theoretical.

Another artificial gravity and weight system often suggested is rotating the ship in flight; centrifugal force would push occupants to the rotating walls which would become "floors." To the passenger, it would be rather like walking, "barrel-of-fun" style, inside a huge tin can. But, again, this method is theoretical, especially in view of the electrical power needed to control the rotating. Today's rocketeers, with full credit to their enormous achievements, are still in the brute-force stage of the art—giving vehicles heavy initial thrust, trying to aim them as accurately as possible, and hoping they'll coast nicely to their target.

Hence it seems likely that, pending the development of artificial gravity (and weight) systems for inflight use, astronauts in the early years of manned spaceflight will have to cope with weightlessness.

How much do space medics know about weight-

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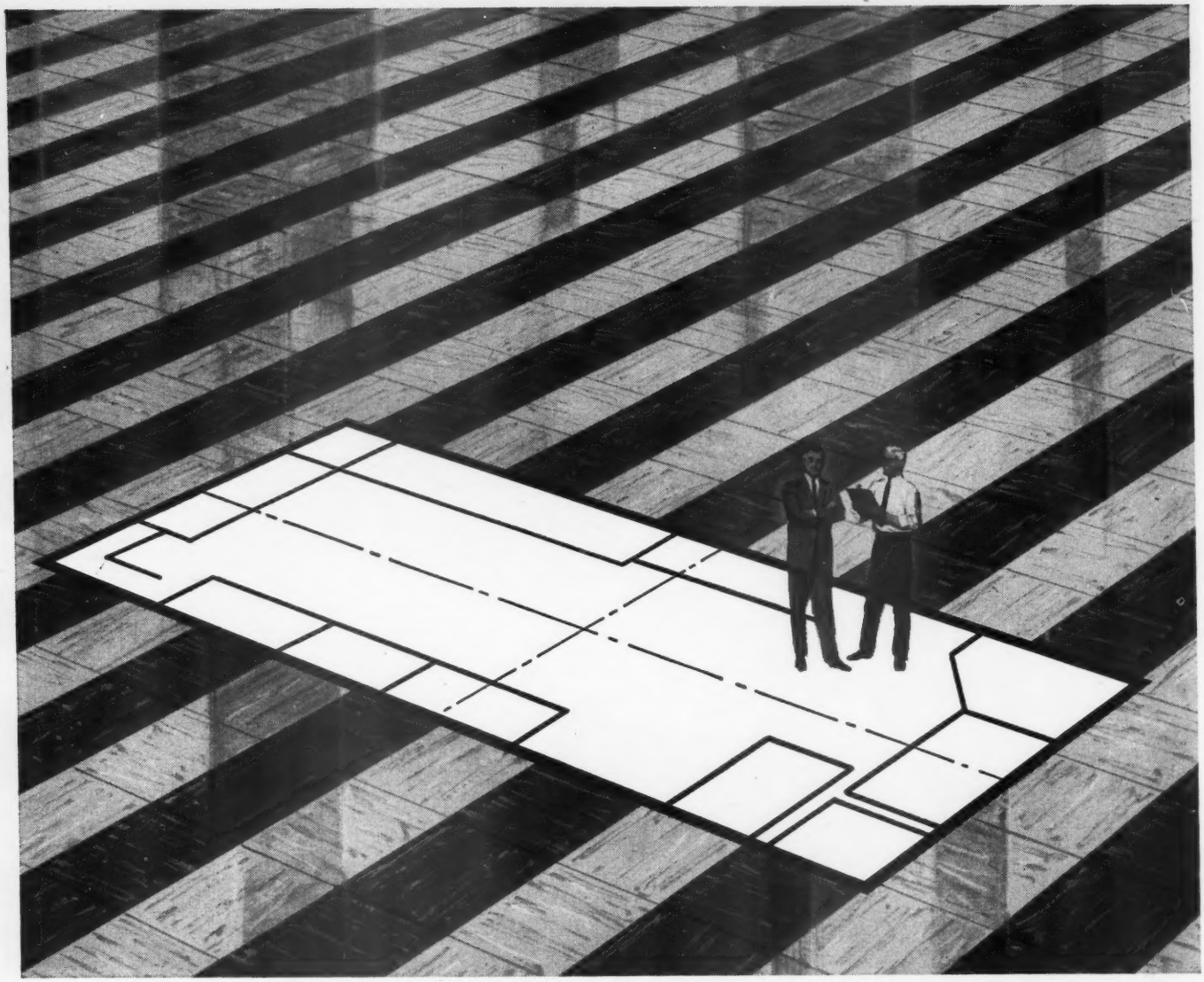

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lessness today? The answer seems ambiguous: a great deal about very brief exposure to weightlessness and nothing about long-term exposure.

Most importantly, they know that it is by no means an instantly fatal condition, as was once believed by some physiologists who suggested that the blood circulatory system could not work without the assistance of gravity.

They know a great deal about short-term exposure to weightlessness, because it is the only kind of weightlessness that can be simulated on (or more properly, close to) the earth. USAF researchers, flying jet aircraft in what are called Keplerian trajectories — somewhat like roller-coaster patterns in the air—have learned that at least a third of their subjects spending up to forty seconds in the weightless state are able to adapt to the situation and perform certain simple tasks. The test most often used involves the marking of a dartboard-like affair with a stylus. Researchers note that, initially, the weightless arm tends to overreach the target, and that it takes practice until the brain and eye learn to adjust to the situation quickly. They also note, and this is significant in rocket-operated spaceflight, that it is harder to adjust to weightlessness immediately after being under G stresses, which would be the case for a spaceman launched into orbit. Also the reverse seems to be true—that it is more difficult to accept G stresses after coming out of weightlessness. This may pose a problem, not only for the spaceman coming in from orbit, but for spacemen landing on Mars after a lengthy weightless journey.

Experts like USAF's Dr. Harald von Beckh of the Aeromedical Field Laboratory at Holloman AFB, N. M., stress the need for psychological preparation for weightlessness. The doctor illustrates his point with an experiment he supervised in which an experienced jet pilot was deprived of sleep, overfed, and then allowed to fall asleep in midair aboard a jet which was then flown into the weightlessness trajectory. The subject experienced considerable disorientation.

Wrote Dr. von Beckh: "His first impression upon awakening was that his arms and legs 'were floating away from him' so that he felt a desperate need to pull them back toward his body. . . . He could not orient himself . . . this, despite the fact that he is a pilot with over 500 jet hours. . . ."

Although the jet experiments have yielded much encouraging data—including demonstrations that, with care, subjects can eat and drink in the weightless state using squeeze-tube devices—the one item that could not be studied was floating and personal locomotion in the weightless state because of the need for loose restraints in the cramped cockpit.

Weightless airman walks upside-down on roof of zero-gravity craft, wearing an experimental pair of magnetized shoes now under study by USAF.

Free floating is now being ingeniously studied by a team of researchers headed by Maj. Edward L. Brown at the Air Force's Wright Aero Medical Laboratory at Wright-Patterson AFB, Ohio. Major Brown's team uses a C-131B, specially padded and modified, with a cabin area a little more than six feet high, ten feet wide, and twenty-five feet long. Although the C-131B "flying laboratory" can only attain up to fifteen seconds of weightlessness, subjects are able to float in mid-air, perform somersaults (which makes most of them ill), and try to propel themselves with a swimming-like motion. Col. John P. Stapp, Wright Lab chief, called it "dry swimming" after being run through the test himself. The tests have shown that, with practice, it is quite possible to propel yourself with swimming motions or to push yourself the length of the cabin much as a swimmer pushes himself across a pool with his toes.

The Wright researchers are also working in their C-131B on mechanical methods of individual propulsion. They are experimenting with compressed air packs strapped to the back to determine the pressure that would be needed for a device such as a gun spacemen could fire to create thrust to propel themselves around the inside or outside of a spaceship. Also, they are experimenting with mag-

netic and suction-cup shoes to see if that approach, familiar to science-fiction readers, is feasible.

One item these researchers are confident of after experimentation is that a crewman strapped into a seat can perform tasks similar to airplane control work with ease—*as long as both men and gear are anchored.*

I had this point clearly demonstrated when in the earthbound Wright laboratory I was placed on a "frictionless platform" consisting of a seat riding on a cushion of compressed air. This device produces one dimension of weightlessness. You lose your anchor to the ground. I was given the simple task of tightening a screw on an anchored workboard. One slight motion and I was propelled several feet away from the workboard. This simulates the difficulty the weightless person encounters in simple tasks unless he is able to hold on tightly to something. The slight energy—uncontrolled—that goes into tightening a screw could push you to the other end of your space cabin.

Weightlessness is truly intriguing. Question after question comes up. How could a person perform the simplest natural functions? To breathe and not be poisoned by the carbon dioxide of his exhalation which might gather up in a cloud in front of his face, he must be assured of a powered air circulation system in his sealed cabin. Elimination processes become less than simple. Although, fortunately, muscular action, not gravity, operates the elimination process, sanitary facilities must be specially designed to avoid undesirable consequences once the body's job is done. Researchers are working on such devices.

Since the early post-World War II days when the Air Force aeromedics rocket-launched and recovered mice and monkeys who experienced and survived "free fall" weightlessness, the subject has become much less of a bogey than it once was. The longest period of weightlessness yet recorded for a living organism was the Russian dog Laika's orbital ride in Sputnik II in 1957. Although the condition had observable effects on the dog's breathing, she survived weightlessness nicely although succumbed when the oxygen supply was exhausted. Of course she was restrained, not floating about her cabin.

Ping-pong balls float in midair in zero-G flight.

The consensus among today's researchers is that the real problem of weightlessness will be psychological—just getting used to it and learning to function, to move yourself around. Certain physiological questions can never be answered until an orbiting human can spend lengthy periods, days, maybe weeks, in the weightless state. Only then can scientists know the effect on earth-born muscles that do not have to cope with gravity. Would muscles atrophy on long, weightless trips, or could they be kept in tone by electronic stimulation devices? What would happen to the blood under long-term weightlessness? The circulation system seems to survive weightlessness and readjust to ordinary gravity in short-term experiments, but could a man spend months in weightlessness on his way to Mars and then accept what might seem an enormous gravitational load on Mars?

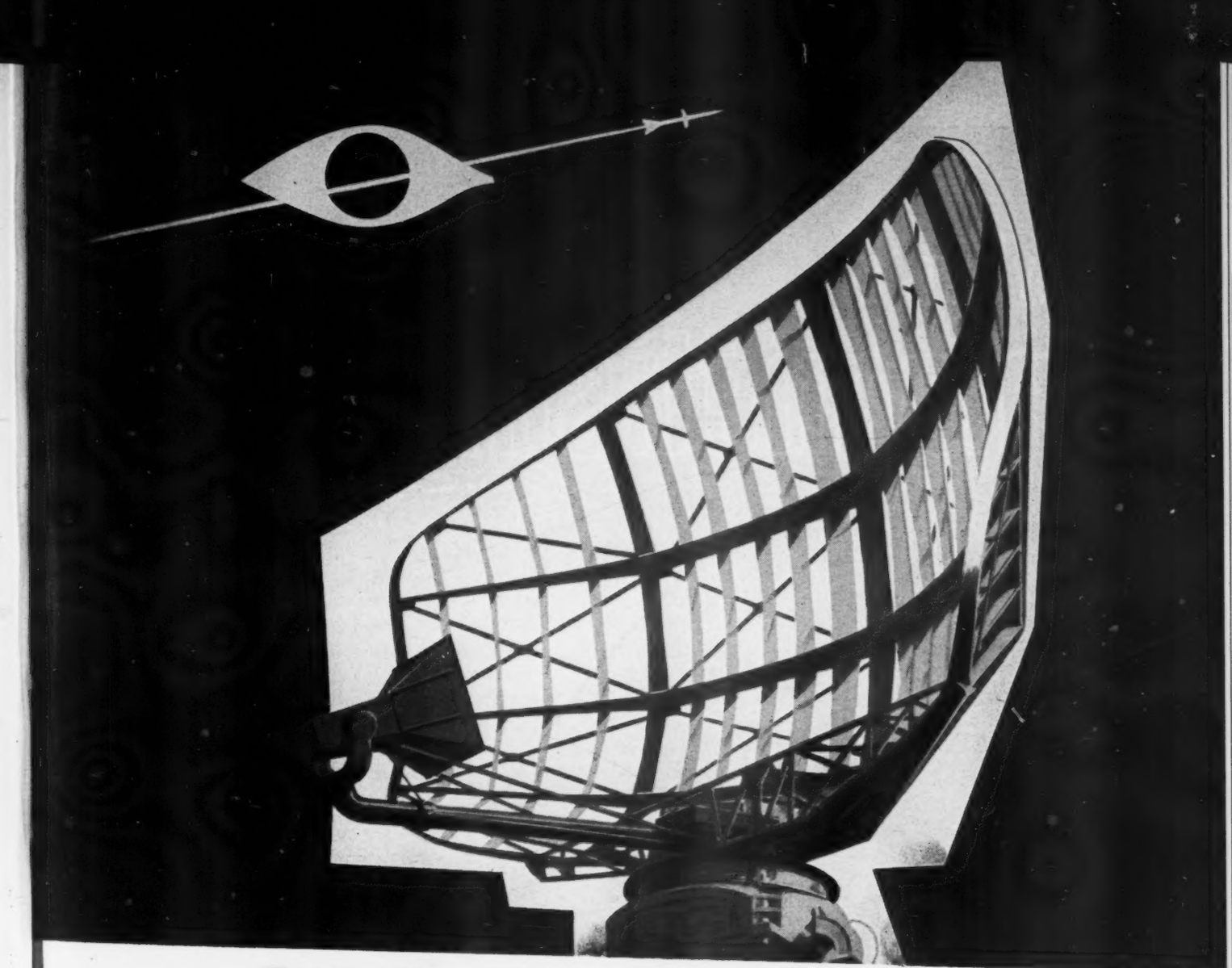
Laika, who holds the present world weightlessness duration title, told us only what could be read from telemetering instruments. The pilots of the X-15 who will experience about six minutes of weightlessness will add to the growing stockpile of data. The Project Mercury orbiting man, although he will probably not be able to float much in his cramped cabin, will yield much more information.

In a few months, the space medics at the Air Force's School of Aviation Medicine, Randolph AFB, Tex., will be moving into their new, expanded quarters at Brooks AFB, on the other side of San Antonio.

Perhaps during the next ten years the Air Force's space doctors and the teams of flyers, engineers, and other experts who have contributed so much to the limited study of weightlessness that is possible on earth, will be able to make another move—this time into orbit, into a space laboratory in the sky.

There, in the space environment, they will be able to study weightlessness "on location."—END

USAF is studying possibilities of providing weightless spacemen with personal locomotion devices. Pack of compressed air cartridges is used to determine amount of gas pressure needed to move a man in controlled direction. Finished device might look somewhat like a hand reaction "gun."



••••••THE WHITES OF THEIR EYES••••••

The whites of the enemy's eyes are now visible half-way around the earth... thanks to technological contributions from Stavid in the area of long-range ballistic-missile detection and high-power radars.

When it becomes operational, the high-power Early-Warning Air-Search Radar now being developed by Stavid will greatly extend the vision of ships in our DEW-line defense network. Innovations in radar transmitter design will provide a compact, high-power system, achieved through new techniques in side-lobe suppression and antenna gain.

Every new advancement in long-range detection finds Stavid in the vanguard, working with exotic as well as state-of-the-art techniques.

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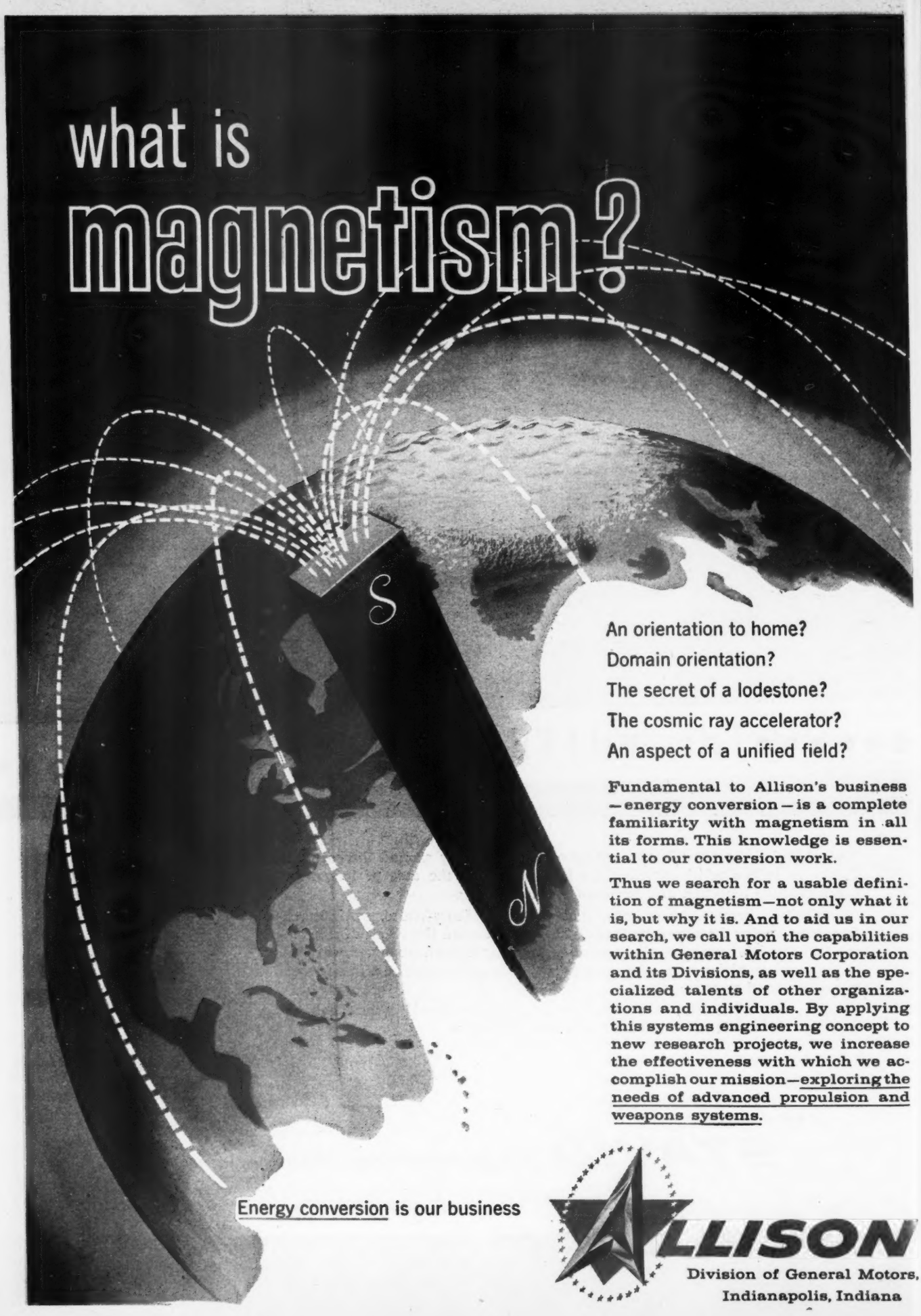
what is magnetism?



An orientation to home?

Domain orientation?

The secret of a lodestone?

The cosmic ray accelerator?

An aspect of a unified field?

Fundamental to Allison's business—energy conversion—is a complete familiarity with magnetism in all its forms. This knowledge is essential to our conversion work.

Thus we search for a usable definition of magnetism—not only what it is, but why it is. And to aid us in our search, we call upon the capabilities within General Motors Corporation and its Divisions, as well as the specialized talents of other organizations and individuals. By applying this systems engineering concept to new research projects, we increase the effectiveness with which we accomplish our mission—exploring the needs of advanced propulsion and weapons systems.

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Division of General Motors,
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Speaking of SPACE

Symington to Investigate Space Waste

Sen. Stuart Symington (D.-Mo.), strong critic of the Administration's defense spending policies, heads a new Senate subcommittee to investigate rivalry and duplication in the nation's space program. Sen. Lyndon Johnson (D.-Tex.), chairman of the Senate space committee, said the new seven-man subcommittee will begin hearings as soon as possible. Noting that at least fourteen agencies or commissions have some responsibility or authority in the national space effort, Senator Johnson pointed out that rivalry is inevitable and often can lead to greater achievement, but warned that wasteful rivalry and duplication must be guarded against.

Senator Symington, long an advocate of service unification, has said that the government should have acted sooner to unify the development of missiles and that the space program should be unified while it is still in its infancy.

Other members of the space subcommittee are Senators Thomas J. Dodd (D.-Conn.), Howard W. Cannon (D.-Nev.), Stephen M. Young (D.-Ohio), Styles Bridges (R.-N.H.), Margaret Chase Smith (R.-Me.), and Clifford P. Case (R.-N.J.).

Second Successful Titan Launch

Twin trails of flame spurted from the Martin SM-68 Titan as the 100-ton ICBM climbed off its launch pad at Cape Canaveral February 25. The ninety-foot missile flew 250 to 300 miles over the Atlantic in the second successful flight test of its first-stage Aerojet-General liquid-propellant engine. As in the first test, the thirty-six-foot second stage was a dummy loaded with thousands of gallons of water for ballast.

According to Hoyle

How and why did it all begin? This question is posed by famed English mathematician and astrophysicist Fred Hoyle in the February 21 issue of *The Saturday Evening Post*. Of the three dominant theories in today's astrophysical thinking—the "explosion," "expansion-contraction," and "steady-state" theories—Hoyle subscribes to the last, in which time and space are considered infinite, and the universe maintains its general cosmological structure through the continuous creation and destruction of matter. "Thus," he writes, "the old problem of the beginning and end of the universe does not arise at all . . . for the universe did not have a beginning, and it will not have an end. Every cluster of galaxies, every atom, had a beginning, but the universe itself did not."

Related reading: *The Universe,* A Scientific American book, Simon and Schuster; *A Modern Universe,* Raymond A. Lyttleton, Harper; *Frontiers of Astronomy,* Fred Hoyle, Harper; *The Realm of the Nebulae,* Edwin Hubble, Yale Univ. Press.

Soviet Space Effort

The following excerpt culled from *M: Iskustvennyy Sputnik Zemli* ("The Artificial Earth Satellite"), by V. Petrov, by the Military Publishing

GEORGE "MOON" MEYERS—By Jack Tippit

". . . and speaking of heaven, we're indeed fortunate to have Colonel George Meyers with us this morning to give us a few points from personal observation."

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Miss Patience, a four-pound monkey, enters the basic psychomotor training unit at the School of Aviation Medicine, Randolph AFB, Tex. The strap-on seat below was designed to carry Miss Patience or one of her relatives into space. Experiments are conducted under American Medical Association rules for humane treatment.

House of the Ministry of Defense of the USSR, Moscow, 1958, indicates the duality of the Soviet space mission.

"Rocket Convertibility: The Soviet Union was the first to build an intercontinental rocket. This means we have priority here. This also enables us to improve the building of rockets, to forge ahead of the United States in this matter, and to build up the desired supplies of rockets in case we fail to agree on disarmament.

"The fact that the Soviet Union was first to launch an artificial earth satellite, and a month later launched another one, speaks for itself. If need be, we can launch a large number of rockets. To do this, we only have to replace the nose cone in ICBMs, install proper instruments in place of the hydrogen warhead, and launch such an instrumented assembly. And there is the satellite."

Thinking Man's Missile?

ARDC's Personnel Lab at WADC, Wright-Patterson AFB, Ohio, reports that retention of missilemen may be increased by asking for volunteers. A sampling of 1,027 airmen indicates that men who would volunteer for a six-year tour with missile squadrons appear to be ahead of those who wouldn't—in personality, interest in AF careers, aptitude, and emotional stability. The biggest differentiating factor favoring the volunteers is original thinking—"these are men who think for themselves."

Current and Projected

Some of the assorted projects in the talking, blueprint, or working stages:

Mrs. V.—Maneuverable, Recoverable Space Vehicle—DoD-ARPA maneuverable satellite; projected next step after the Dyna-Soar orbital vehicle.

Saturn—DoD-ARPA clusters of four to sixteen 1.5-million-pound-thrust Rocketdyne engines, to be flight tested in the fall of 1960; may use Titan for second stage, Centaur's second stage for third stage, storable-liquid fourth.

Centaur—Modified Atlas plus 15,000-pound-thrust liquid-oxygen and hydrogen Convair and Pratt & Whitney second stage and storable-liquid third stage; will shift from ARPA to NASA July 1; mission unknown, but may be moon, Mars, or Venus; expected to be ready in 1962.

Nova—Cluster of four 1.5-million-pound-thrust Rocketdyne engines as first stage, another of these engines as second stage, liquid-oxygen and hydrogen third and fourth stages, fifth might be a storable-liquid engine; NASA Project with destination Mars.

Rover—AEC-NASA nuclear rocket, probably with a six-million-pound-thrust cluster first stage.

Vega—Atlas first stage, GE X-405 (used as Vanguard's first stage) second stage; later version would include third-stage storable-liquid engine under development by Jet Propulsion Lab of NASA; DoD-ARPA project, may be

ready in two years; will be able to send payloads to Mars or to Venus.

Scout—Low-cost ($500,000) four-stage solid-propellant vehicle being developed by NASA for inertial guidance and aerodynamic tests by mid-1960; first stage, Aerojet Senior (used in Jupiter and Polaris first stages); second stage, improved Thiokol Sergeant; third stage, modified Vanguard third stage; fourth stage, Vanguard third stage; may also be used for re-entry tests or small-animal biological studies.

Sentry—Series of nine one-ton camera satellites; DoD-ARPA; to orbit beginning in September 1959, launched by two-stage version of the Atlas from Cape Canaveral.

Pay Now, Fly Later

Brig. Gen. Don Flickinger, Assistant Commander of ARDC for Bioastronautics and member of NASA's Special Committee on Life Sciences, estimates that it will cost $1 million for every pound of payload to put a man in orbit for forty-eight hours.

Vox Spatii

The first space oratorio has been recorded, by Vox Productions, Inc., 236 West 55th St., New York 19, N. Y. Written and directed by Willy Ley, and with the familiar title "Rockets, Missiles, and Space Travel," it features the voices of Generals Schriever and Yates and space experts Von Braun, Ehricke, and Dornberger, along with the tremendous and varied noises of our mightiest missiles blasting off. How high the Fi?

Space Education Tools

Willis C. Brown, Specialist for Aviation Education, Department of Health, Education, and Welfare, Washington 25, D. C., has a new leaflet listing books for students in the upper elementary grades through senior high school, *Bibliography of Recent Books*

Sperry Gyroscope's inertial system for the X-15 research plane is examined by Sperry president Carl A. Frishe (right) and engineer Nathan P. White.

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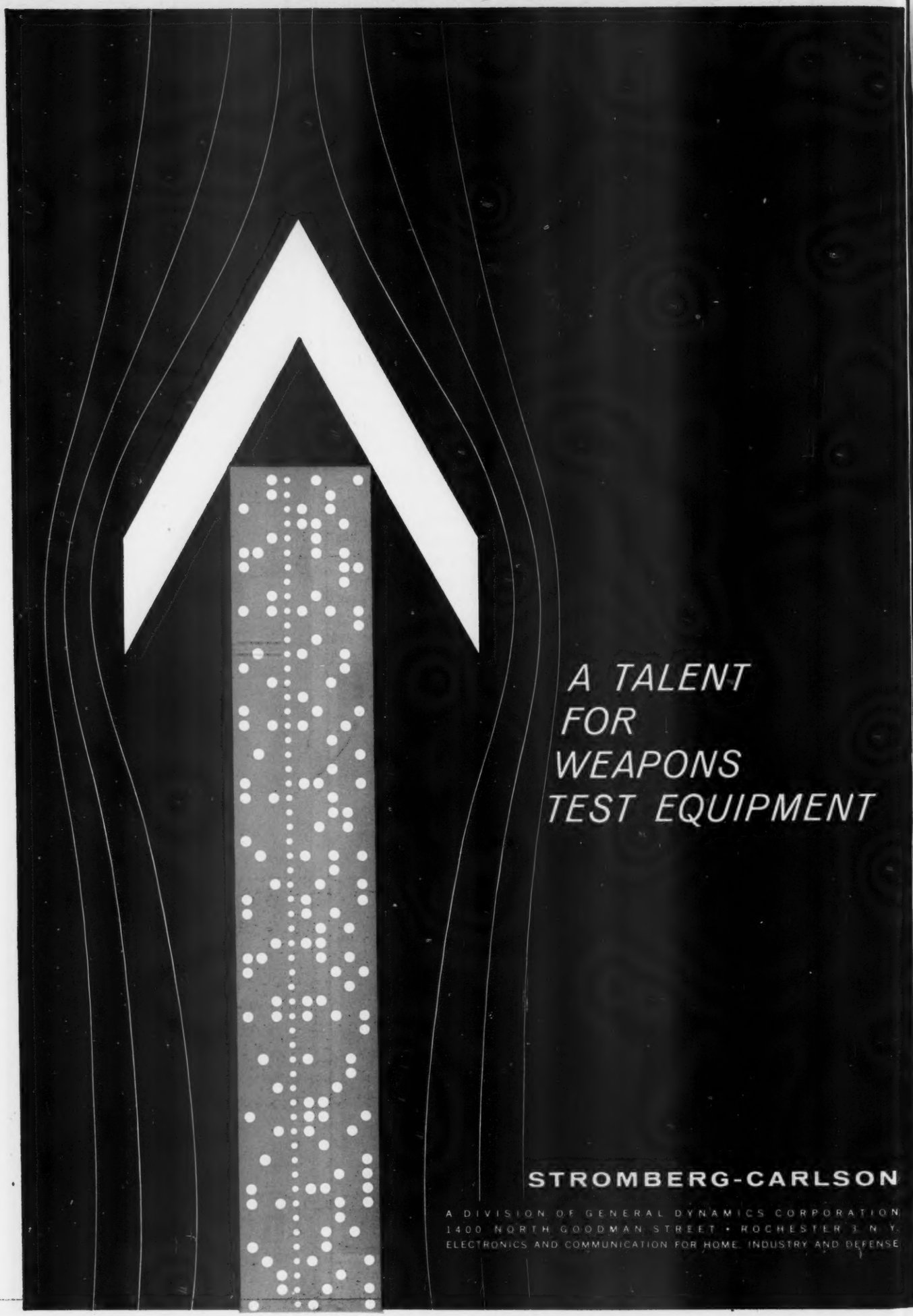
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About Jets, Rockets, and Space Exploration, 1953-1958. Also available from Mr. Brown: a list of courses in air transportation and management offered in sixty-two colleges and universities, *Air Transportation and Management Courses,* Circular 550.

"Time," a new science film for grades five through nine, has been released by the Audio-Visual Center, Indiana University, Bloomington, Ind. Using live actors, models, and animation, the film illustrates scientific time determination. Also recommended for beginning astronomy courses in high schools and colleges.

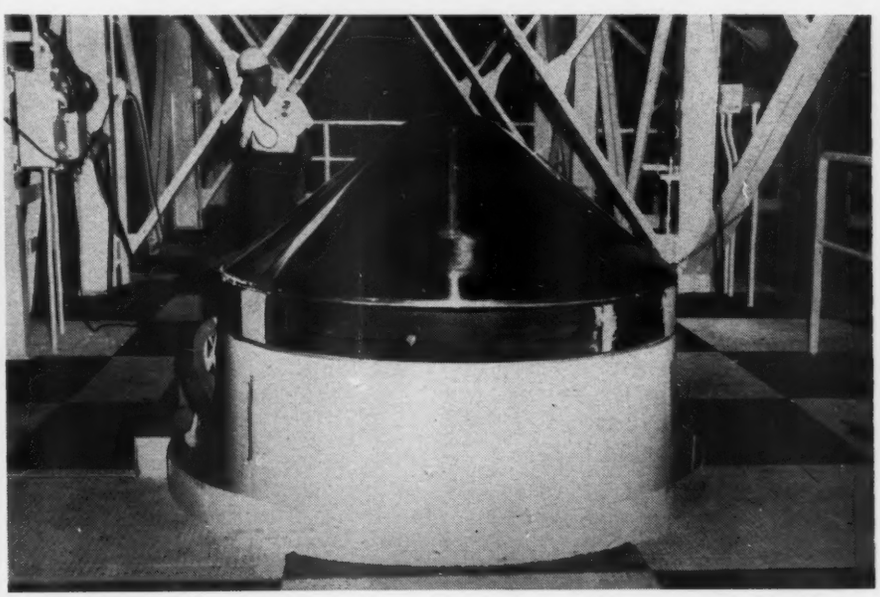
Autonetics, a division of North American Aviation, Inc., has produced a 16-mm., twelve-minute, sound-and-color film, "Destinations of Tomorrow," tracing the development of inertial guidance systems. Highlights include the basic scientific principles involved in autonavigation systems and construction and testing of equipment. Available for public use, except in theaters or on television, from the Public Relations Department, Autonetics, 9150 E. Imperial Highway, Downey, Calif.

"Time and Space," a teaching guide for junior high science and math groups, compiled by Eldon Scriven and Rosemary Anderson of Northern Illinois University, includes material on man and time, man's exploration of the threshold of space, and communication for the space age. Also lists texts, related books, films, and experiments recommended for space-age juniors. Available free from the National Aviation Education Council, 1025 Connecticut Ave., N.W., Washington 6, D. C.

Speech Briefs

Dr. Fred Singer, professor of physics at the University of Maryland, to the Americans for Democratic Action, Akron, Ohio, March 7: "The Russians are very likely to launch a manned space station before we do and perhaps even get a man to the moon. . . . It is therefore of vital importance for us to gauge *right now* the impact that a Russian manned satellite would have on the world, and make sure . . . it will not be misused by them for propaganda." Singer's suggestion for a slogan for the control of outer space: "That nation which controls the earth completely can control outer space—if the Martians will permit!"

Dr. James R. Killian, special assistant to the President for science and technology, before the Economic Club of Detroit, Detroit, Mich., February 23: "The future of the United States, to an extraordinary degree, is in the hands of those who probe the mysteries of the atom, the cell, and the stars. Especially is this true of that tiny part of our creative effort which



Large shiny nose cone of Douglas SM-75 Thor is worked on by technicians while the huge missile is in the launching stand shortly before takeoff.

Critical problems in weapons system testing: the reduction of test time with increased test reliability . . . the reduction of equipment costs with increased test flexibility.

The search for a system meeting these requirements has led to the SCATE concept of standardized block design.

SCATE—Stromberg-Carlson Automatic Test Equipment—embodies existing hardware as a nucleus.

Implementation with special stimulus generators and response monitors rounds out the SCATE system, which meets the testing needs of any weapons system, component, or sub-assembly . . .

and is flexible, self-checking, self-calibrating . . . brings lower cost, new speed and reliability to weapons testing.

Brochure available on request.

S-C STROMBERG-CARLSON | GD GENERAL DYNAMICS

MOMENT IN HISTORY

THIS IS THE "FIRST FLIGHT" of the new Air Force TITAN, America's most powerful weapon and our No. 1 challenger in the big-missile field. Time: 2/6/59—4:22 p.m. EST. The most important thing about this moment in history is not visible here—and it is this: Three years to the day from the breaking of ground at Martin-Denver, TITAN No. 1 roared into the sky. Those 36 months saw the creation of the free world's most advanced ballistic missile facility—and the development, production, testing, delivery and launching of the first of an entirely new *generation of ballistic missile weapon systems, forerunner of the Global Ballistic Missile. TITAN is the result of an advanced engineering concept—developed by Martin under the direction of the Air Force's Ballistic Missile Division of the Air Research and Development Command—which provides the most extensive pre-flight testing of components, subassemblies and full scale missiles ever undertaken. This method in the TITAN development, and in the generations of space systems to follow, may well be one of the most important single factors in speeding America's bid for space supremacy.*

PACE

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we inadequately term basic research. Today less than 20,000 scientists and engineers, or about one ten-thousandth of our population, are engaged in this very special kind of activity, and only about two percent of our scientists . . . are engaged in basic research.

"While this number should be larger, we must always expect that this 'growing edge' of our national life will be occupied by small numbers, because only a few, relatively, of our population will have the rare creative qualities of mind, the motivation, and the education to be productive on the edge of the unknown.

"The smallness of this group and the burden of the future which it carries point up the importance of our identifying, encouraging, and educating to the limit of their potential, all the exceptional minds in our population. It points up the importance . . . of investment in people as well as investment in plant and equipment."

5-4-3-2-1–Zoom!

Father doesn't have to go fly a kite to amuse the youngsters these days.

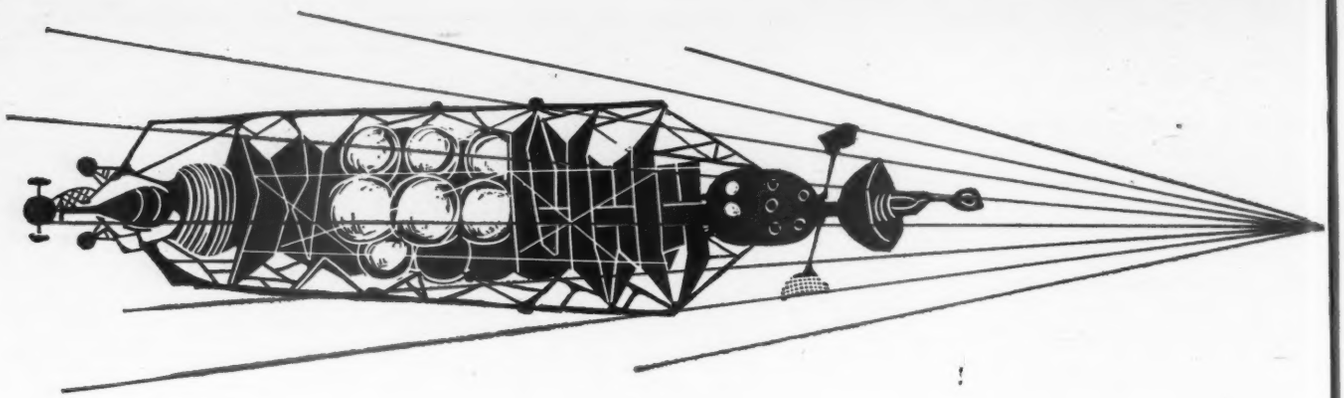
A New York department store now advertises a two-stage, sixteen-inch "Lunar-1" rocket for sale at $5—plus 30¢ for two batteries. Complete with launching platform, countdown blinker, and remote-release cord, the moon rocket hurtles into space. At eighty or ninety feet, the first stage drops off, and the second stage is thrust to a peak of 300 feet. Tracking and recovery are left to father.

Solar Bullishness

John Brooks, in the February 7 *New Yorker* magazine, presents a thorough picture of solar activity. One conjecture: correlation of sunspot cycles and the stockmarket.

"One favorite hypothesis," Mr. Brooks says, "holds that stock prices tend to be high when sunspots are numerous and low when sunspots are scarce; the explanation most commonly offered is that extra ultraviolet radiation, which is known to suffuse the earth and its atmosphere at sunspot maxima, makes people feel bullish, while the lower radiation level between peaks tends to reduce them to a melancholic, or stockselling mood."

—MICHAEL B. MILLER



SOME SOVIET THOUGHTS

ON TAPPING THE ENERGY

NOW that man has begun to penetrate cosmic space with electromagnetic waves, rockets, and space satellites, scientists turn to the task of tapping the energy of these vast regions.

This simple statement may seem astonishing to many, since cosmic space is filled with extremely rarefied gas containing an utterly insignificant amount of energy per unit volume. But there are, nevertheless, various sources of energy within cosmic space.

Obviously, one may speak of solar rays or rays emanating from specific stars. However, this radiation cannot be regarded as energy belonging to cosmic space itself. For it may be received on earth, the moon, or other planets.

Furthermore, its actual energy becomes insignificant in the boundless reaches of space. The natural law governing this fact is that radiation energy at any point is inversely proportional to the square of the distance from the origin of the radiation. The sun and other celestial bodies produce such radiation, and resultant energy is great in their immediate vicinities but not at vast spatial distances.

In addition, use of solar radiation or other radiation in space is limited by the extreme difficulty of putting such energy to work even where it is present in sufficient amount.

Proposed projects for utilization of solar radiation envisage concentration of the rays by use of mirrors and transforming it into heat, mechanical work, or electrical energy. This would be used in the ejection of a jet stream of some substance from the rocket for the purpose of acceleration or a change in direction of motion.

Such use of solar radiation, its proponents have suggested, would eliminate the need for space vehicles to carry all necessary energy with them from earth as they would by present spaceship plans.

But the fact is that solar radiation trapped as described would not be enough in itself to achieve the desired results. A spaceship would also have to carry with it a supply of a substance which, being acted upon by the radiation-formed energy, would produce the necessary jet stream.

And, once the supply of the substance had been exhausted, the radiation-formed energy would once more not be enough in itself to continue ejection of the jet stream.

Thus, it can be seen that solar or astral radiation can be used to propel a spaceship only if the ship carries along with it a tremendous inert mass of reactive substance instead of a similar, perhaps identical, amount of ordinary fuel. It is apparent, at the same time, that radiation as a source of energy in the near future may not be completely useless, but it certainly is not as significant as may be assumed by some.

This conclusion, however, should not be a cause for pessimism. The reserve of energy available in cosmic space is not restricted to radiation alone.

Cosmic space is interlaced with various force fields. First of all, universal gravitational forces are in effect. These constitute basic factors in the motion of celestial bodies; they must always be taken into account when plotting the trajectories of space vehicles. If a spaceship approaches a planet, gravitational force from the planet will increase the ship's velocity by imparting supplemental energy to it.

Such energy cannot be used for the general guidance of space vehicles. Therefore, gravitational force as such can have little importance as a source of energy.

Two other significant force fields, in addition to gravity, are the electric and electromagnetic. These fields have not yet been sufficiently explored, although their presence and tremendous importance are no longer in doubt.

It is known that particles carrying electrical charges form cosmic rays that attain velocities close to the velocity of light. They also attain tremendous energy as they move through spatial electromagnetic fields. The latter may be considered gigantic super-strong accelerators of elemental particles such as those built in nuclear physics laboratories

That the Soviets are busily firing the imaginations of their people—particularly their youth—with the possibilities of space travel is evidenced in this article, a free translation from the Russian journal Tekhnika molodezhi (*Engineering for Youth*). *The article, signed by Prof. G. I. Pokrovskiy, who is an important figure in Soviet astronautical efforts, discusses the possibility of using electromagnetic fields in space as propulsion force for what the journal refers to as "astral ships."*

OF COSMIC SPACE

throughout the world in recent years.

To make use of electromagnetic fields in the cosmos, spaceships would have to carry certain equipment that nobody is designing yet, although similar equipment is in blueprint stage for other purposes.

Basic elements of such equipment for spaceships would include two elementary particle accelerators. One would be for acceleration and ejection of positively charged particles or protons, which are in effect hydrogen ions. The other accelerator would be for negatively charged particles or electrons.

With the first accelerator in operation, positive charges would leave the ship and make it negatively charged. If in a space electrical field, the ship would move toward the positive pole of the field.

If the electron accelerator were in operation, the ship would acquire positive charge and move toward the negative pole.

Thus, change in sign and value of the spaceship's charge under such conditions would alter acceleration and direction of the vehicle.

Of course, in the use of such a system the positive or negative charge would have to be ejected from the spaceship with sufficient energy so it did not fall back against the ship from which it was fired. It would, of course, be attracted to the oppositely charged ship.

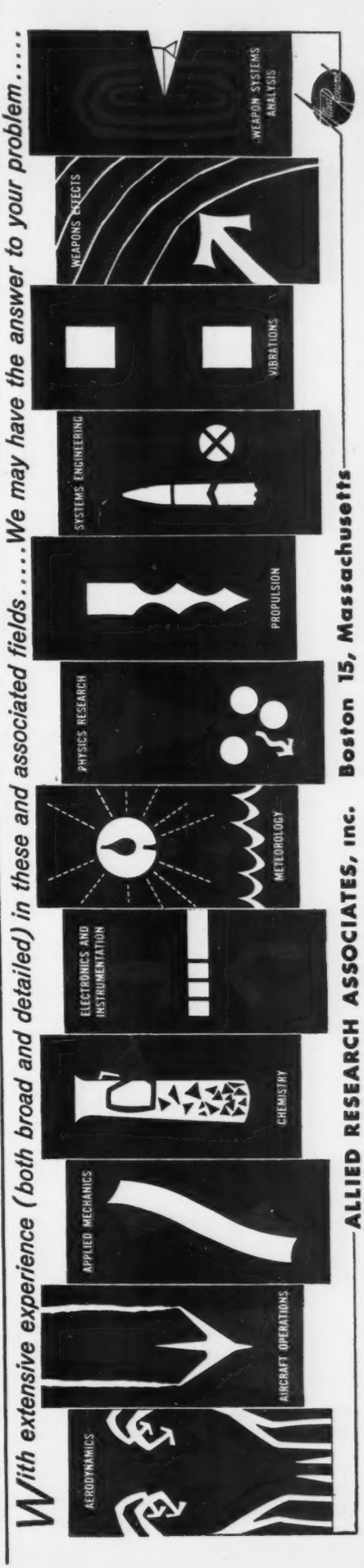
If the ship were divided into two isolated compartments with regard to electricity, it would be possible to steer the ship in space by charging each section with different, variable charges.

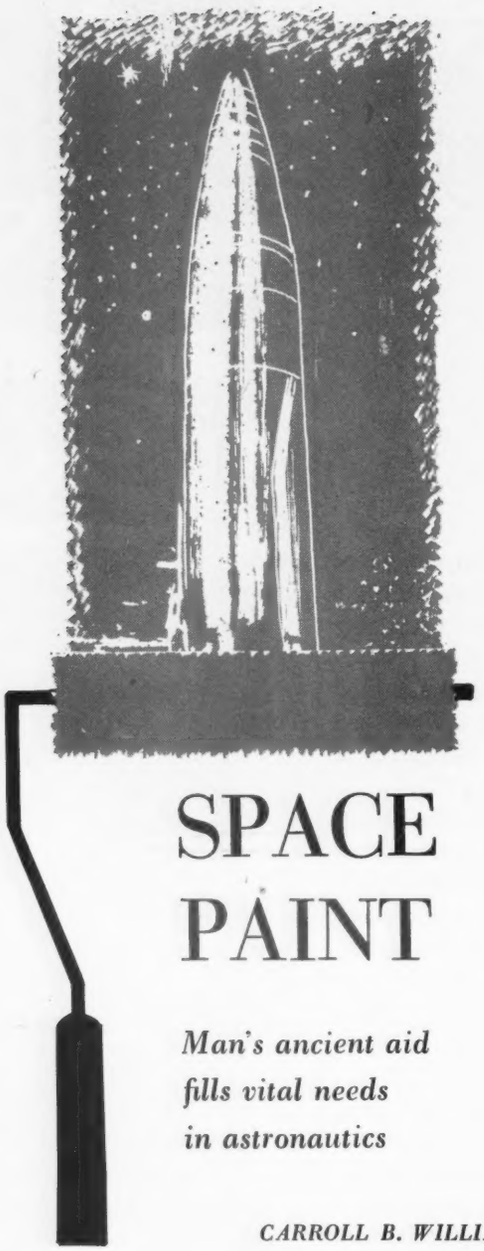
Should the ship, further, be caused to rotate speedily and be charged properly, it could be transformed into a gigantic magnet. . . .

Forces developed under these conditions may not be very great in a majority of cases. However, it may be assumed that electromagnetic fields within the boundless reaches of space could be used to guide the flight of a cosmic ship—at least at a distance from massive celestial bodies.

The reserves of ionized material needed for such guidance are quite small. The energy necessary for ejection of ions can be obtained either from radiation or a small fuel amount—the latter ordinary or, preferably, atomic. The energy of such fuel will be insignificant as compared to that contained in the cosmic electromagnetic fields and available for propulsion of spaceships.

And so we see that boundless cosmic space is not only the road to faraway worlds, but also a world in itself full of untapped sources of energy. We will be able in the future to obtain energy not only from substances found on earth and other planets—such as coal, oil, gas, uranium, thorium, deuterium, and lithium—but also from cosmic space, which we have only begun to penetrate.—END





SPACE PAINT

Man's ancient aid fills vital needs in astronautics

CARROLL B. WILLIAMS

PAINT—known to mankind for some 50,000 years—is vital to man's conquest of space.

Thus, a product whose first known application was as Stone Age decoration has reached its current high degree of sophistication, helping missiles gather invaluable scientific data.

The product of the chemical industry, found on many United States missiles, is not there for decoration. It is there for scientific purposes.

Careful planning and sparing use mark the story behind the various types of paints demanded by engineers and scientists, *Chemical News,* published by the Manufacturing Chemists' Association, points out.

The sparing use of paint is dictated by estimates that indicate that, for every one pound of paint used, ten pounds of propellant are required to lift it, a factor that is of special significance in the case of large missiles.

The black bands and spiraling stripes girding various rockets, for example, serve as measuring points. Using them as guides, engineers are able to determine a rocket's rotational rate, its angle of flight, and even slight deviations from its predicted course.

Certain rockets carry swatches of paint. These paints are there either (1) to inhibit corrosion of delicate parts, or (2) to protect electronic instruments inside from excessive heat at predetermined vulnerable points.

To reflect heat, the Vanguard, which has successfully put a satellite into orbit, is "painted with a thin coat of silicon monozide, designed to reflect heat."

The Jupiter-C, which has successfully put three satellites into orbit, utilizes a specially made paint on its nose cone, designed to help control internal temperatures.

Application design of the paint is a heavy determining factor. Black and white stripes are used to absorb and reflect heat. As the cone spins, the stripes keep within desirable limits the wide range of temperatures encountered by a rocket in flight.

Some stripes use a zirconium oxide paint especially developed to absorb and release heat under varying conditions encountered in flight.

Just as various types of paints are used for the interiors and exteriors of houses and buildings generally, so too specially formulated paints are used on the interiors of missiles, especially those designed for recovery.

The revolution in paints covers virtually every field of endeavor. New types of paints that dry in a fraction of the time of conventional products are being used on an experimental basis by appliance and automobile makers. . . .

Paints for making building materials in industrial plants, schools, office buildings, and residential structures fire-resistant and near fireproof are being produced in increasing quantities, as are paints for waterproofing and damp-proofing, and for providing vapor barriers.—END

This article, by Carroll B. Williams, business editor of the Baltimore Sun, *is reprinted with permission of that newspaper and of the author.*

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Space Vehicles

LABORATORIES IN THE SKY . . .

and Military Vehicles

LLOYD V. BERKNER

UNDER our almost insulating atmosphere we can sense the nature of the universe only through one octave of light, a few octaves of radio waves, the interaction of a few very energetic particles on our atmosphere, and examination of a few meteorites. The result is an almost monochromatic view of the universe.

The simple satellite, as we now know it, extends our scientific capabilities beyond this insulated view. It now permits us to see the universe for the first time in its full range of "color," in the special sense that the satellite broadens the range of our vision from a narrow spectrum to the whole spectrum of nature—from the shortest to the longest wave lengths, from the lowest to the highest particle energies. . . .

We have said that the satellite views the universe in the full range of chromaticity. To the astrophysicist this means that the word "color" takes on new meaning in speaking of the universe. Through his access to the whole range of color of radiations and of spectral distribution over this whole range, he can now view the complete manifestations of atomic behavior in the stars and gaseous plasmas in space. Certainly, our knowledge of the origin, evolution, and destruction of the matter of the universe will be revolutionized by such information obtained from suitably instrumented satellites. Eventually, an inhabited astrophysical observatory on the moon may become desirable and necessary to enjoy fully the advantages of space astronomy. This would, incidentally, be a fine international objective rather than a competitive effort among nations.

Closely related to general astronomy are observations of our own sun—the origin of the energy for life. Our knowledge of the physics of the sun, its changes, and the causes of those changes is surprisingly scant. But above the atmosphere where we can see the sun in its full glory, and where we can enter the corona at will and even approach the sun's surface, we can study the radiation distribution, the spectral phenomena, the magnetized plasma, and their changes with time, phenomena that are major clues to the sun's behavior.

Turning to the earth itself, satellites have already given us a new figure for its ellipticity, 298.3, so we are learning of its real figure. Much more accurate mapping and geodetic surveying is already in sight with an ultimate precision of perhaps ten feet that will permit critical tests of such hypotheses as continental drift. But perhaps the most important contribution to the earth sciences will come in the field of meteorology. I will stress meteorology at some length, since it illustrates so clearly the great new power that the satellite provides to geography and geophysics by its ability to scan the whole earth quickly.

We learned in high school that the earth's atmosphere can be regarded as the gas of a kind of heat engine. The equatorial region is the firebox that receives a net gain of energy from the sun and stores much of the energy in water vapor that is evaporated. The polar regions are the condensers of this great heat engine, where the atmospheric

gas suffers a net loss of energy by an excess of radiation of heat into space. Thus, the earth's atmosphere is the only great heat engine that uses a radiator as a condenser.

The circulation of the atmosphere that brings us our weather arises from the transfer of heat from the equatorial firebox to the polar condenser. Unfortunately, the heat input and the output to the engine are not constant. The input changes as variation of equatorial cloud-cover reflects more or less of incident heat from the sun back into space; the output depends on the reabsorption in the atmosphere of heat radiated from the surface, as the gases within the atmosphere that reabsorb the radiated heat are redistributed. Furthermore, a small change in rate of overturn of the oceans by changing winds can change supply of the heat to or from the atmosphere, locally.

Moreover, the equatorial energy is collected by the trade winds and carried to the meteorological equator where it is piped up through huge equatorial thunderstorm cells to the troposphere to be circulated into the temperate zones. Perhaps 5,000 of these equatorial thunderstorm pipes normally occur each day. But occasionally such cells may fail to form locally or conceivably may direct their energy into the wrong hemisphere to produce temporarily hemispheric unbalance of stored heat. All of these localized changes in input and output may upset the already doubtful stability of the atmospheric flow.

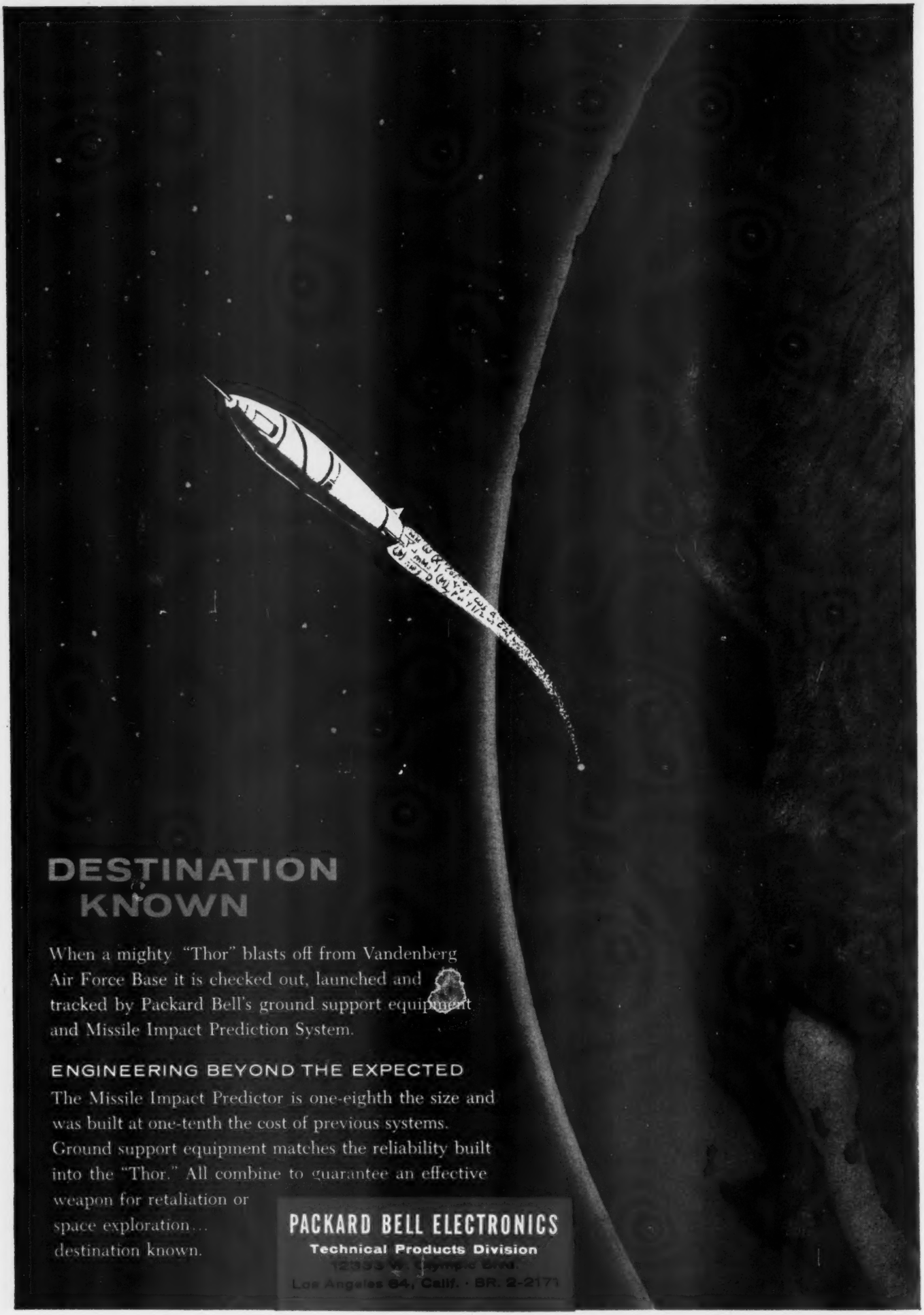
The circulation of heat from the equatorial regions toward the poles is not as simple as it would be through a series of pipes. Instead, the heat is conveyed through couplings between a series of vertical circulation cells successively in the equatorial regions, in the temperate zones, and in the polar regions in each hemisphere. Sometimes, these cells do not transfer heat from one to another as expected, with a resultant delay in the heat transfer and consequent buildup of unusually hot and cold spots, or a rerouting of the ordinary flow patterns. The delay may extend for a considerable time, but when the breakdown does occur, the effects on the weather may be catastrophic. Such gross effects cannot be traced or understood until the whole earth is observed at very frequent intervals with appropriate measuring devices.

Viewing meteorology in this way, it is not surprising that, through inability to make fundamental global measurements, our present methods of forecasting are far from perfect. By itself,

limited observation from a few poorly distributed points on the surface cannot possibly provide the basis for the continuing global description of atmospheric circulation and underlying heat balance and exchange that is the very basis of our weather and of climatic change.

The satellite holds promise of revolutionizing our powers of observation in the field of meteorology. Among the early satellite experiments will be a measure of the heat balance of the earth and the variation of that heat balance from place to place, i.e., the map of input and output radiation and the changes of that map with time. For the mapping of the hot and cold spots in the sense of excessive input to or output from the atmospheric heat engine is certainly feasible from the earth satellite. Not far behind will come experimental mapping of the cloud and storm systems over the whole earth. This involves delineation of changes and movements of storm systems at frequent intervals and the observation of cyclo-genesis. It should not be difficult to count thunderstorms by flash frequency of lightning on the dark side of the earth, or "radio-static" discharges produced by lightning on either the sunlit or dark hemisphere, and to map development and movement of active frontal areas.

I could go on to many other powerful experiments critical to meteorology. To what extent do meteoric dust particles of microscopic size vary in density from place to place as they are swept up by the earth as it courses along its orbit? Are such particles of meteoric dust of the kind and numbers that can influence rainfall, as Professor E. G. Bowen has suggested?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In the field of pure physics is a whole range of experiments, but we might mention positive test of the general theory of relativity through measurement of gravitational red-shift in the lower grativational field enveloping the satellite. This involves comparison of an atomic clock in a satellite with one on the ground, a comparison involving a measurement to one part in a billion-billion. Yet this certainly will be done in the next few years, since it is so fundamental to progress in the whole of science, and we now have atomic clocks capable of the necessary precision.

Likewise, the sampling of meteoric dust in space will add to our knowledge of the universe, its mass, and the processes of formation of matter. The interaction of cosmic rays with the particles of space can give us knowledge of the age of such material. . . .

But aside from their great power to science, satellites are of almost immediate commercial utility. The Christmas message of President Eisenhower [from the "talking" Atlas] highlights the potentiality of satellites for relaying communications. Certainly, a variety of schemes can be used to provide tens of thousands of new channels of communications over great distances using satellite relays powered by energy from the sun. The value of such channels for all purposes, including international television, far exceeds the costs of the satellites; they are certain to become regular features of our economy.

Of particular interest for communications is the hovering satellite launched eastward to a little more than 22,000 miles in height. Circling the earth at the rate of its rotation, it will remain continuously in the same line of longitude or can be made to hover stationary over a fixed point above the equator. The advantage of a hovering satellite for communication relay is obvious. And so, in a number of ways, space activity will extend our economic potentialities. . . .

Interplanetary travel imposes an immense complex of difficulties to be overcome and problems to be solved. Yet, theoretically, all of them can be solved within the framework of our present basic capabilities with time, effort, experiment, and patience. The pattern of development of such space explorations will probably be:

- Lunar, interplanetary, and solar probes to circle the moon, Mars, Venus, and perhaps penetrate close to the sun, to transmit back their scientific findings.
- Hard landings of certain durable experiments on the moon and planets.
- Soft landings of permanent or semipermanent experiments that transmit their data back, with possibly automatic return of such vehicles to earth with samples. This would amount to a mechanical spaceman.
- Short-range experiments of man in space, perhaps in a few satellite orbits.
- Soft landings of man on planets with reasonable probability of return. By this stage, a wide range of safety measures must have been developed and tested.
- Establishment of planetary bases. Such bases could conceivably be manned by a series of soft landings without immediate expectation of return.

This is a long and difficult program, and it will require many years for completion. Yet it certainly seems capable of completion in the remaining years of this century, that is, within the first forty or fifty years of the space age.

So far I have talked of the capabilities of space activity in the constructive sense. But what problems of international politics are such vehicles likely to impose?

Certainly the space vehicles of one nation can be made to behave in a fashion that another nation does not like, a behavior that seems inimical to its national interest. Certainly, satellites crossing boundaries can collect a variety of intelligence data concerning surface features and construction, movement of transport, and communications information. They can jam communications accidentally or deliberately, or preempt communications channels. Imagine the psychological impact of a Soviet satellite steadily hovering over the US, on any task, without US concurrence. Satellites can be made to broadcast voice or television into the territories of others quite beyond their present control and in a way very difficult to jam. Unpredicted satellites can trigger early warning systems and create fears that might cause wars.

Any instrument of one nation that can be used contrary to the interests of another certainly has military capabilities and can be used as an instrument of war. Therefore, occupancy of space has clear military implications. Certainly, the presence of unregulated satellites in the near future will require development of military capability of nations to knock them out or disable them in some way. Consequently, man is faced with the prospect of agreeing on rigid international space-launching supervision and control or, alternatively, developing a space military capability for disabling space objects that appear to operate contrary to national

interest. Certainly an effective agreement on control is to be fervently desired, not only to avoid constant military friction and action in space, but also to optimize the benefits that space can provide to mankind. In the field of communications, for example, agreement on channels, and on cross use of one another's relay satellites, is imperative if the great new benefits to communications are to be enjoyed by all.

But in considering the problem of regulation and control we can well avoid one pitfall. In creating such an international agency, politicians will almost inevitably attempt to endow such an international agency with operating as well as with regulatory functions. In this country of individual initiative, we know well the conflict of interest of the operating as contrasted to the regulatory function. Our own system recognizes regulation as a proper governmental or international political function, but equally recognizes operation as a function for individual enterprise and enthusiasm.

The success of the IGY, in my opinion, arose from its organization as an international scientific enterprise, operated *by scientists,* with the consent, cooperation, and aid, but not the direction of governments. Therefore, an agency for regulation and control should be just that—it should leave the scientific and commercial enterprise to those most competent and willing to do the job, within the framework of regulation and control established by the international governmental agency. Only by this clear separation of function can we avoid a kind of international socialism of a pattern that has never yet been found successful. For regulatory bodies tend to be reactionary and conservative and will kill off useful applications unless legally pushed by those who know how to do things.

A second troublesome problem is that of secrecy. Because of the inevitable failures accompanying man's first space attempts, there has been widespread feeling that no account of advance planning for attempts in space should be made public. Rather we should, as a nation, play the Russian game of acting the strong silent giant who hides his failures and surprises the world with his successes.

This attitude seems to me to be infantile and even insulting to a moderately adult world. Certainly, men everywhere view failures with understanding and even respect for the attempt to solve problems at the very forefront of man's capability. Men everywhere have the right to share in the plans, attempts, failures, and successes in the halting steps toward the conquest of space. Indeed, the very people who must foot the bill certainly have the privilege of some voice in the debate on what should best be done.

But we might be a little careful on how we formulate and publicize our objectives. If Pioneer I had been projected as a very high shot with the scientific objectives that it indeed achieved, it would not have been listed as a failure. The nice clean miss of the Lunik on the moon was still a great success as a "solar satellite." Nevertheless, as a people, we should not take ourselves too seriously and become stuffy in trying to create this illusion that failure never occurs to us.

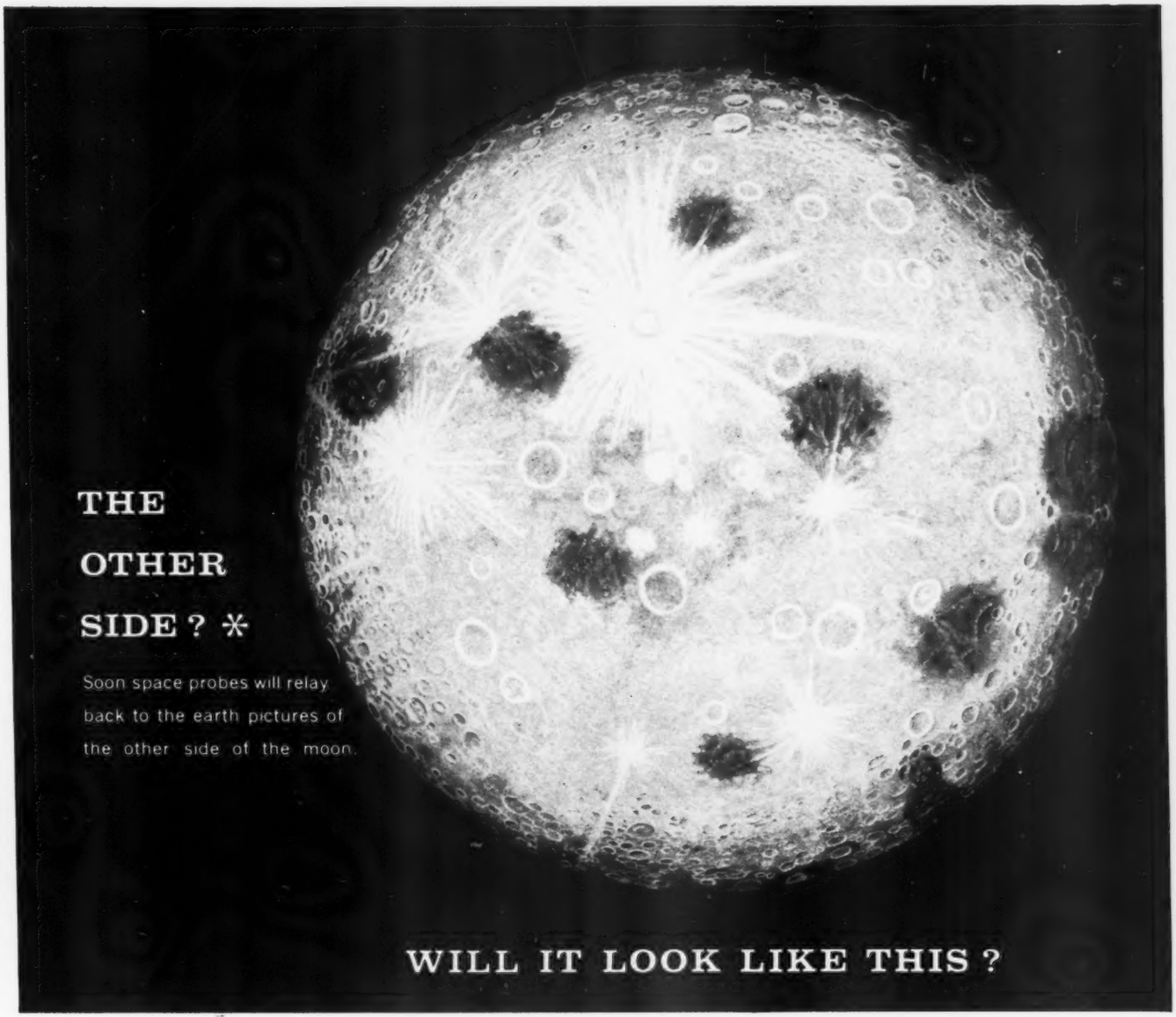
On the contrary, widespread advance public information can encourage new brains to join in our efforts. The world will respect our successes all the more if it can share with us our problems. For to achieve these striking objectives, the base of our space program among our scientific brains must be broadened.

Because of the fantasy that has surrounded space in the past, many reputable men have avoided association with space thinking for fear of being branded "space cadets." But reality puts this era behind us, and our universities and institutions must accept boldly the capabilities of the future in fashioning their programs of scientific thinking and research. It makes no sense at all to waste lifetimes on observations from our earthly prison when the same lives could fashion far more powerful and effective scientific methods from the space capabilities now at hand. . . .

The achievement of man's destiny must be earned by the pursuit of objectives fashioned to his most advanced capability.—END

Credited by many as the "father of the International Geophysical Year," Lloyd V. Berkner is president of Associated Universities, Inc., an educational institution sponsored by nine leading universities to operate research facilities including the Brookhaven National Laboratory of the Atomic Energy Commission. He is now chairman of the Space Science Board of the National Academy of Sciences. His earlier career included World War II naval service in the radar and communications fields and the distinction of having served, at the age of twenty-three, as Adm. Richard Byrd's radio operator on the first flight over the South Pole. This material is condensed from a recent speech by Mr. Berkner.

* *This scientific representation based on current knowledge was prepared under the supervision of Dr. I. M. Levitt, Director of the Franklin Institute Planetarium.*



At this time no one knows. But intricate electronic devices in projected lunar vehicles will reveal this hidden surface. Instrumentation has extended the long arm of man to reach as far as the mind can project. With such devices as a key, science can unlock the door to the future and to the very universe itself.

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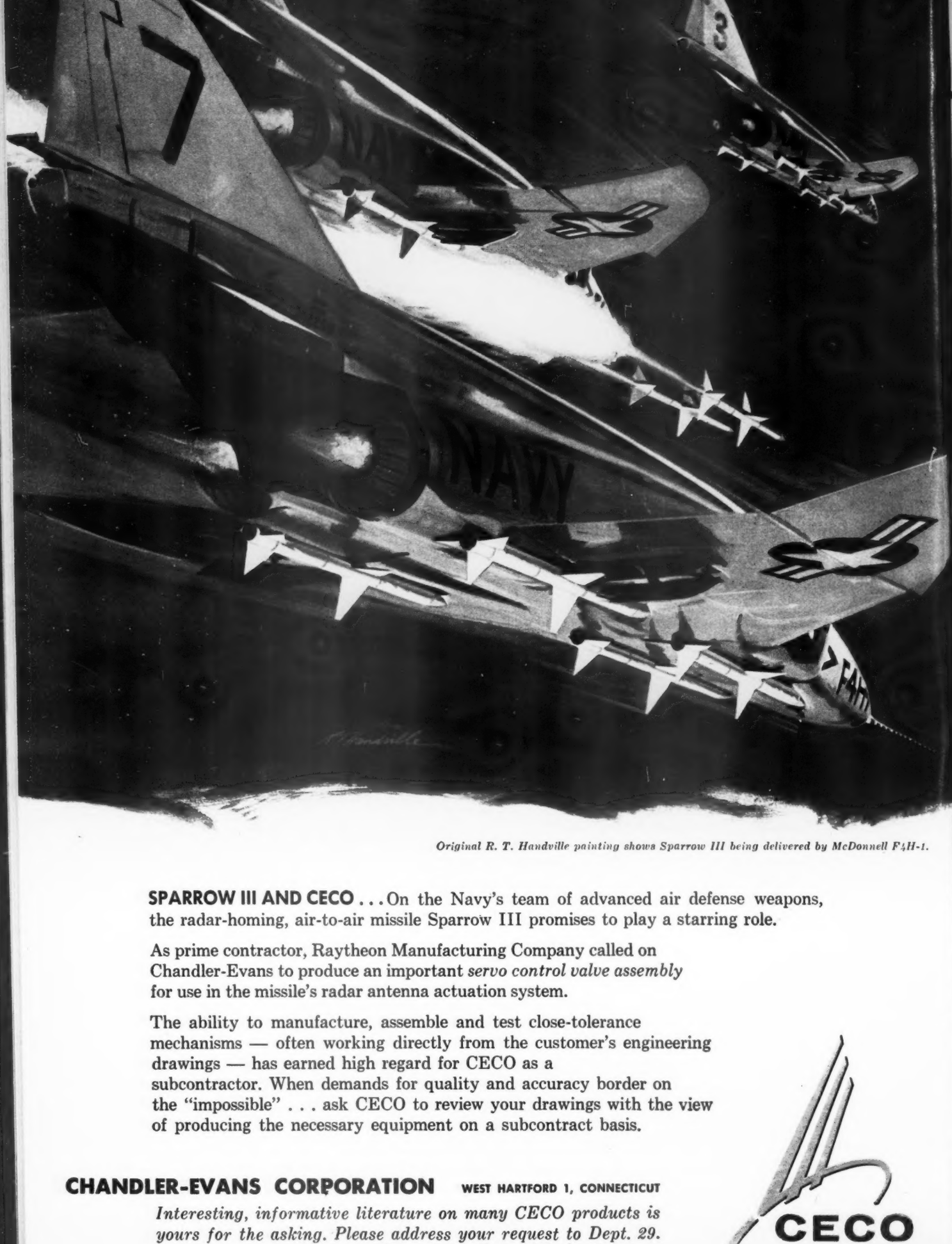

Original R. T. Handville painting shows Sparrow III being delivered by McDonnell F4H-1.

SPARROW III AND CECO . . . On the Navy's team of advanced air defense weapons, the radar-homing, air-to-air missile Sparrow III promises to play a starring role.

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Report on Aeroflot . . .

Riding Red Airways

Harriet Porch

Sovfoto

Except for Cyrillic lettering, Moscow airport looks like US counterparts.

THE DRONE of Soviet airliners plying the face of the globe lends new emphasis, day by day, to boastful Kremlin words heard round the world.

The words, which came from Russian Premier Nikita Khrushchev about a year ago, were these:

"We hereby declare economic war against you. We will soon surpass US economic output."

The planes belong to the vast, high-prestige, highly significant Russian commercial airline, Aeroflot—a major cold-war weapon with a split-second mobilization billet in the event of shooting war.

I recently visited Russia to obtain a close-up look at Aeroflot, which Russia has urgently beefed-up as a flag-waving symbol and a business enterprise in the past few years. I flew Aeroflot routes extensively.

I was impressed. I also found the Russian airway surprisingly substandard in some areas.

Nevertheless, I feel certain that it presents still another Red challenge to the free world that we must meet and overcome. But more about that later. For the moment, let's take a look at Aeroflot.

First, it cannot be pointed out too strongly that Aeroflot has now emerged as a leading tool in the Russian regime's continuing "peaceful" campaign for world supremacy. It is consciously utilized as an instrument of foreign policy.

Although inferior in some ways to its major international competition, Aeroflot flies one of the largest route systems in the world (*see "We Flew Aeroflot" by Richard Stockwell and Blaine Miller, December '57* AIR FORCE). This is constantly expanding. Bilateral agreements bring the Russian line into most capitals of the world. And new turboprops slated to go into operation shortly will carry the message of "socialist progress" even more effectively.

Moscow's Aeroflot-propaganda efforts move right along also, keeping pace with technical and organizational developments. The goal here is familiar: to impress the uncommitted and neutral nations and at the same time discredit the West and its achievements.

I found it was not unusual to pick up a copy of Aeroflot's official organ, *Avianskaya*, and find stinging criticism of US air carriers. Subjects spotlighted included bomb scares, congressional investigations into stock speculations last year, "cruel exploitation" of employees by US operators, the recent airline strikes, and the fact that many US airlines receive federal subsidies.

International expansion through a series of treaties with foreign governments is Aeroflot's keynote. Officials expect new reciprocal agreements in the near future. The Russians are trying to reopen negotiations with Japan for flights into Tokyo, for example.

In the Western Hemisphere preliminary talks were reported with Canada, and the Russians were known to be casting longing eyes toward routes into New York. An agreement was signed with British European Airways in 1958. As soon as the Soviets can satisfy noise level requirements at London Airport, BEA-Aeroflot services will begin operation between London and Moscow.

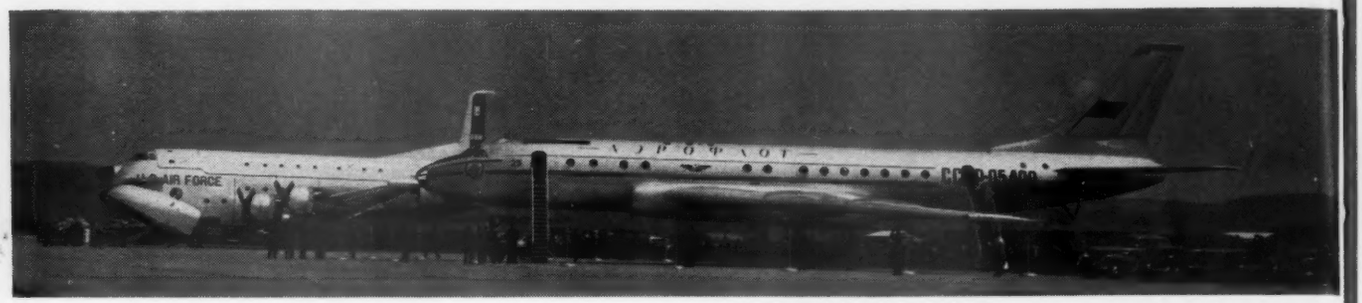
Shippers in many parts of the world will soon be faced with a choice between western carriers and Aeroflot. Aeroflot does not have to make a profit. It does have to impress the world with the advantages of Communism. If Russia chooses to lose on Aeroflot, it can balance the books on some other phase of industry or trade.

A French businessman, whose company exports a large volume of citrus fruit to Russia, told me that he sells lemons to the Russians for $1.80 a kilo (a little over two pounds). The Russians, in turn, sell them to the public for nearly $1 a lemon. He asked one of his interpreters how she felt about this. She calmly replied that the State needed the extra money for in-

(Continued on following page)

Sovfoto

Russia's pride and joy, the enormous TU-114, scheduled for service on Red line.



Side by side, USAF's C-124 Globemaster and the now regularly scheduled Red TU-104, photographed in Switzerland.

dustry and armament and the people were glad to pay higher prices for that reason.

Under such conditions Aeroflot can obviously afford to offer the shipper a lower rate than other airlines. And, because it does not belong to the international airline organizations (ICAO and IATA), Aeroflot cannot be penalized. Similar price cutting could be put into effect in passenger travel. There is at present no indication that Aeroflot is planning such moves. Nor was there any indication of the Sputniks or of Lunik.

Evidence that Russia thinks along these lines in the aviation sphere was provided when Moscow tried to peddle the TU-104 jet at cut-rate prices throughout the world. But the plane is uneconomical, and potential buyers turned thumbs down. A better plane at reduced price might have achieved more satisfactory results for the Kremlin.

Aeroflot also has functional demerits —lots of them.

In 1956 and 1957 Aeroflot was telling Western visitors that it planned great improvements in domestic schedules, that air fares were to be reduced to the level of train fares, that passenger handling was to be improved and terminals and airports enlarged. Very little of this was evident during my visit to the Soviet Union at the end of 1958.

The seven airports I visited were crowded and passenger handling methods antiquated. Scheduling is done at the convenience of Aeroflot, not the passengers. Also, there was no visible sign of runway or airport building expansion. At the last Communist Party Congress plans were unfolded for many new airport buildings, the first to be at Kiev. Vague references to a new airport near Moscow circulated during my stay in the USSR.

It was evident, however, that the size of the jet fleet has increased, that these planes are extremely well maintained, and service on the jets (schedules, interior decor, meals, and stewardess service) has improved. Long-distance domestic and international routes are now being served by TU-104 jets. The IL-14 Convair-type propeller-driven plane is also still used on these long routes as well as in all short-haul service.

The fare for jets is higher than on propeller-driven planes. But there appear to be plenty of passengers ready to pay the jet premium. The cost of air travel in the USSR formerly limited it to officials and the military. Now some reduction in air fares is making it possible for the layman and his family to travel by airline.

Immediate as well as long-term planning seems to center around the TU-104, the TU-104A, and the introduction of the large and showy TU-114D and IL-18 turboprops.

I saw what I believe must have been the TU-114D taxiing to a hangar at Moscow's Vnukovo Airport. It was by far the largest airplane I have ever seen. Published reports say it has a wing span of 177 feet and grosses 413,000 pounds. I was certainly impressed with it, even from a distance, and it will no doubt bring similar reaction wherever it is shown.

There is a narrow dividing line between "military" and "civil" in the Russian aviation world. All USSR planes are designed with military uses in view. The TU-104 is a modified bomber. The TU-114D appears to possess the same general characteristics as the TU-104 but on a larger scale.

But while the TU-104 was hurriedly put into production with operational and economical sacrifices, the new turboprop is being carefully tested and modified before its unveiling. It is reported that the TU-114D has been making cargo runs to Tashkent and Peiping to test its capabilities.

There has apparently been little progress in ramp equipment for the airports. I was shaken over seeing sleek TU-104s being towed by ancient stake-bed trucks. There are no ramp starts of the jets, and they are towed to the end of the runway. I saw no forklifts at any time. Baggage carts and passenger loading stands are battery-powered.

The steps on the larger passenger loading stands can be lighted—but often are not. I was allowed to inspect one of these loading stands and found it up to Western standards. However, the side panels at the top are not movable. This often causes poor positioning at the planes because the airplane doors prevent the stand from fitting flush to the plane. I saw no hydraulically operated stands, but these are probably not practical because of the extremes of weather in the USSR.

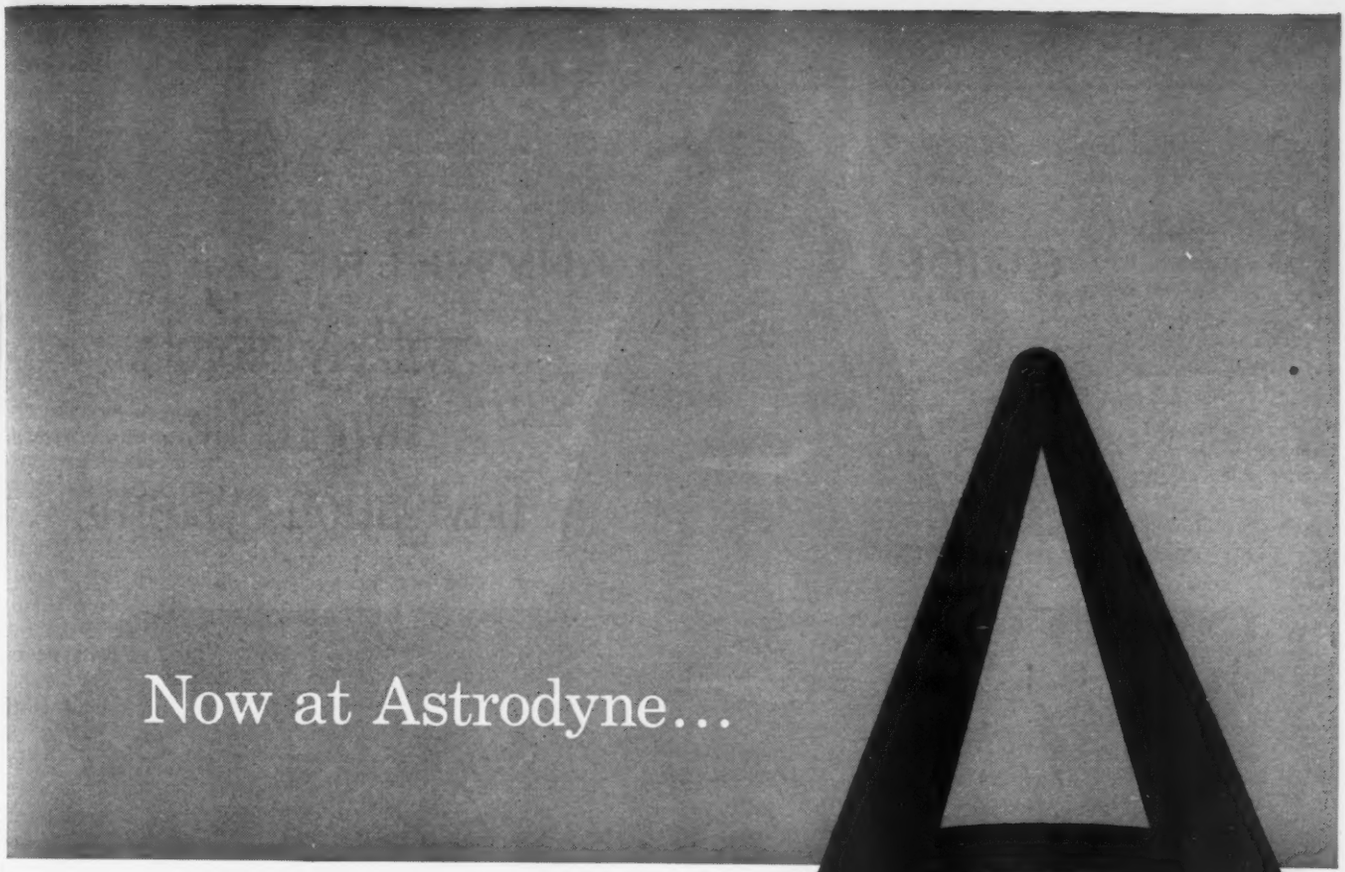
Baggage for the propeller-driven planes is carried on board by a porter. It is then put into a baggage compartment aft of the coat racks. On the TU-104, baggage is loaded by hand from a truck or cart into the belly pits.

I watched snow removal at Moscow

(Continued on page 139)

Sovfoto

Part of the growing short-hop fleet that is taking Aeroflot all over the Russian map, this is the IL-18 turboprop aircraft, which has recently been introduced.



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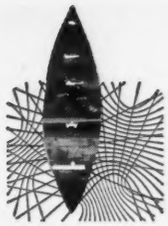


From pin-point positioning of small tactical vehicles in combat areas to critical, repetitive fixes for long-range aircraft, spacecraft, ships and submarines... Motorola leads the way, fulfilling the requirements of the military... with *guidelines to anywhere.*

Based on low frequency, CW phase comparison techniques, these short, intermediate and long-range navigation systems provide precise position coordinates without line-of-sight restrictions and with a minimum of contamination from most topographic and man-made obstacles.

Three typical military programs under contract to Motorola in the field of hyperbolic navigation are:

PINS—A short-range position fixing system for all types of tactical vehicles and combat personnel. Light in weight, accurate to within feet*, this system has been reliability-proved under a wide range of environmental conditions.

DRONE GUIDANCE—An intermediate-range system capable of accurately guiding drone aircraft. Positioning data is provided to within yards* under all conditions of weather or terrain.

RADUX-OMEGA—A long-range, very low frequency system designed to yield fractions-of-a-mile* accuracies on a global scale. Ultimately, Radux-Omega could offer world-wide positioning service for aircraft, surface vessels and submarines.

Motorola engineers have also developed specialized computers, compatible with the above systems, providing instant readout in latitude, longitude, or military grid. In these units weighing less than 7 pounds, hyperbolic data is translated with a conversion accuracy of .01%.

For unclassified* information on Motorola's extensive design advances in the field of hyperbolic phase comparison navigation systems...or for details on career opportunities...write: Motorola, Inc., Military Electronics Division, Dept. B., 8201 E. McDowell Road, Phoenix, Arizona.

**Specific capabilities of these systems can be obtained by properly cleared personnel who establish a "need to know."*

MOTOROLA

Military Electronics Division

AEROFLOT—CONTINUED

by old oil trucks modified as snow plows. Very little of a ramp is cleared. Passengers mush out to the plane over hazardous ice and snow. When ice or snow becomes deep, it is cleared by the blast of a truck-mounted jet engine driven around the field.

Taxiway and ramp lighting were poor at each of the fields I visited. Even at Moscow's large airport there is green reference lighting on only one side of the taxi strip. Planes are parked all over the ramp, so incoming flights must feel their way about using landing lights. At only one airport did I see a guideman using wands to aid parking.

One good point is that an instrument landing system meeting ICAO standards has just been purchased by the Soviets. The system will soon be installed and technicians trained by a British company.

Fueling still remains a problem to international carriers operating into Moscow. At present only 100-octane fuel is available, although 110 is promised. Sabena representatives decided that the 100-octane samples submitted to them in November 1958 were not up to standard, so they continue to carry enough fuel on their DC-7Cs for a round trip between Brussels and Moscow, at the expense of payload.

About a year ago it was reported that a system of airport fog dispersal effective for short periods was being used in the USSR. A. S. Chorney, airport manager at Kiev, said several methods had been tried, but none was very successful, and research was still being conducted on this problem. At the time of this interview I had been in Kiev four days waiting for the fog to lift.

It is widely said that Aeroflot is approximately two years behind United States carriers. I agree so far as material factors are concerned.

But from the passenger's viewpoint, I feel Aeroflot is about twenty years behind us. A traveler used to commercial airlines in the free world feels a bit neglected on an Aeroflot flight so far as service is concerned. International flight service, however, is much better.

I also found my first IL-12 flight shocking from the standpoint of flight safety, a field in which I have worked myself for some years. The IL-12 is a twin-engine plane smaller but similar in appearance to the Convair 340. There were no seat belts on this flight. Many of the passengers were on their feet during takeoff.

It was twenty-five below in Moscow at departure time, but what really chilled me was the failure of the pilot to warm up his engines before takeoff. He started them up and off we went.

In the air the plane's tail began a methodical swaying back and forth as if someone were playing with the rudder. The flying weather was good so this could not be attributed to turbulence. Finally the crew moved the baggage from the rear to the front of the passenger cabin and the swaying stopped. Obviously, a weight-and-balance manifest plays little part in Aeroflot operations.

Domestic passengers also are seldom kept informed of changes in flight schedules. Some grumbling is heard, but the Soviet passenger seems to take it all in his stride without asking questions.

An incident along these lines took place on a flight from Lvov to Chernovtsy. Although visibility was good over Chernovtsy, the plane was sent back for a nonscheduled landing at a field which handled both military and civil flights. The only explanation when we landed was that "Chernovtsy is not accepting traffic." After a thirty-minute stop we were loaded back on the aircraft. Following a quick start and short taxi and takeoff we were flown to our original destination, Chernovtsy. Consistent failure to warm up the engines made me mentally review emergency procedures on each flight.

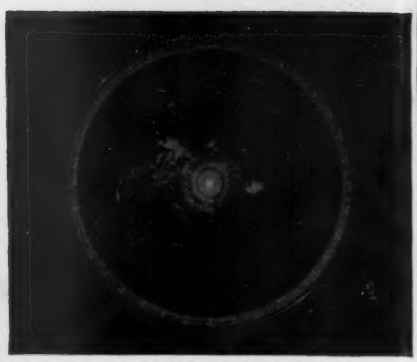
Another instance of the passenger's not being informed was a departure delay of five hours on a Moscow to Riga flight. The only explanation given was that Riga was closed due to weather and would not be open until evening. A request to visit meteorology to check a weather map or find out if Riga would be open later was denied. When the plane finally did land at Riga, we were told that Riga had had good weather and the field had been open all day. I suspect the delay was caused by a mechanical factor.

Aeroflot pilots seem very capable and well trained. On the trip from Moscow to Riga we had a woman pilot assisted by a male copilot. The pilot was a large, attractive woman, about thirty-five, and wore several medals on the lapel of her uniform. On the ground she handed her report to another woman pilot who was presumably to fly the plane back to Moscow.

The IL-14s still carry a mechanic, whom they call an "engineer." One time when an engineer came back into the cabin for magazines, he smelled strongly of beer. Apparently

(Continued on page 141)

Now, not just "blips", but
detailed pictures out of the soup!



Conventional radar scope "blip" image.

New Philco high resolution radar picture.

Philco pioneers new concepts in

ALL-WEATHER HIGH RESOLUTION RADAR

From the wonder-world of advanced electronics comes this Space Age "all-seeing eye." Compact enough to be used in a wide variety of advanced operational vehicles, Philco high resolution radar is especially well suited to air and space navigation, reconnaissance and combat area surveillance.

Philco, in conjunction with the USAF Air Research and Development Command, has perfected new techniques in radar signal processing. Called REDAP*, this new system produces clear, detailed pictures of any area in topographic relief, from behind the protective cover of cloud screens, midnight fog or extremely high altitudes.

At Philco, human resources, plus ultra-modern facilities add up to amazing versatility and gigantic capacity. Current activities include research and development in such fields as missiles and guidance, weapons systems, electronic computers, infra-red, communications and navigational systems, as well as advanced radar techniques.

In the wonder world of advanced electronics, look to the leader. Look ahead . . . and you'll choose Philco!

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engineers are not under the same restrictions as flight officers about drinking prior to flight.

Jerome Lederer, managing director of the Flight Safety Foundation, asked me before I left the US to present the book *Human Factors in Air Transportation* to the medical director of Aeroflot. Dr. Asrebaekov, in accepting this gift, granted me a lengthy interview through an interpreter on Aeroflot crew composition.

Aeroflot's crew standards are similar to ours. In addition to annual physicals, however, pilots are also given brief physicals before each flight. Crews are required to remain in special crew quarters twelve to twenty-four hours before flight time. The length of time depends on the number of hours to be spent in the air on the forthcoming flight. Here they are under medical observation and receive proper rest and food. An aircrewman is bumped from a flight if he is found to have consumed liquor within twenty-four hours of the flight.

The tremendous contrast between Aeroflot's size and potential and its inadequacies is, of course, amazing. To the Western mind the whole airline is as confusing as it is striking. It is a young, awkward giant—long on muscle, short on refinements.

Watching operations at the hub of the wheel, Vnukovo Airport, was like watching three or four different airlines, none of them with up-to-date standards. It is difficult to realize that they are all run by a single so-called central board. Aeroflot handles all civil air work in Russia, including negotiations with foreign airlines, building and maintaining airports, the civil air network, the Arctic air network, and a mammoth agricultural and "flying-doctor-ambulance" service.

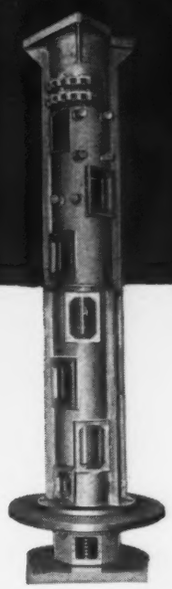
This board has the status of a ministry, with its full title being Civil Air Fleet of the Council of Ministers of the USSR. All the directors or members of this central board also are high-ranking military men. At present, the head of the central board is Chief Air Marshal Zhigarev. He deals with all the important organizational and administrative questions on a day-to-day basis.

The board is composed of Marshal Zhigarev, his assistant, four deputy heads, and two departmental directors.

One of the departmental directors is in charge of construction at the airports, and the other director is a chief inspector who covers airworthiness requirements, enforcement of

(Continued on following page)

Coins Courtesy of Newark Museum



...but not for Slip Rings!

Coin silver has been used for thousands of years to make coins, and it has proved completely satisfactory for this use. However, *Coin Silver* as a slip ring material has many deficiencies which have been eliminated through the use of electro deposited *Fine Silver*. For example:

COIN SILVER (fabricated)	FINE SILVER (electro-deposited)
1. Can only be work-hardened which, after machining into rings, may vary from "dead soft" to 150 Brinnell.	1. Rings are of uniform hardness throughout, with grain size controlled by ETC's exclusive electro-deposition process.
2. Rings have soft spots due to brazing heat applied when terminal is attached, resulting in uneven wear.	2. Rings are electrodeposited into a groove making direct contact with a prepositioned terminal, eliminating this defect.*
3. Rings must be of sufficient cross-section to be mechanically rigid to withstand handling during fabrication.	3. Rings are never handled individually as such. Thickness is dictated by electrical and wear requirements. (Saves weight and cost).
4. Tarnishes rapidly, rate of tarnish proportional to copper content.	4. Free of all (electrically) contaminating elements.
5. Initial contact resistance is 1.6 times that of fine silver. Increases 5-fold in four days.	5. Initial contact resistance is .625 that of coin silver. Takes 21 days to reach 5-fold increase in resistance.

For a more complete comparison, write for Electro Tec's technical report, "Comparison of Silver, Silver-Copper Alloys, and Copper in Slip Rings."

When silver is indicated for your slip ring assembly, it pays to specify electro deposited fine silver for a better product at a lower cost.

*Pat. No. 2,696,570 and other patents pending.

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standards, etc. All other department heads in Aeroflot are responsible to the functional board members except those in charge of labor, finance, planning, and economics who report to Zhigarev's assistant.

Vnukovo Airport has a total staff of approximately 2,500, including porters, ramp workers, passenger agents, control-tower operators, and maintenance people. There are weather-briefing officers at the airport for pilots. Two-hourly charts are prepared here, and a Europe-Africa synoptical chart is prepared each day. Teleprinters are used to gather and send out weather information to the various Soviet Republics.

Whenever I had an opportunity to talk with airline people in the Soviet, I tried to learn something of their safety standards. Apparently no records are kept of damage to aircraft and ground equipment, although shift-change talks are held each day to discuss incidents and accidents around the airport and prevent recurrences. Although they readily admitted one known TU-104 crash, the Russian officials pretended not to know about others.

Aeroflot shows a profit each year. The airline does not, however, pay interest on its purchases of new equipment. Details of the fiscal side of Aeroflot have never been revealed.

In studying Aeroflot's organization, in flying on its planes, and observing its operations, one cannot help but feel that the free world is about to face an aerial competitor far tougher than it realizes. This type of competition could have a real effect on our economics and our relations with neutral or uncommitted nations.

The US has long been the leader of world civil aviation. She can remain so if a well-thought-out program is put in motion. Such a program must make unmistakably clear that the US wants to help other countries build stable economies through sound air service; that we stand ready to assist with good products as well as technical aid. As we push our own jet age, we must keep in mind as well the aviation needs of less developed lands, and produce and sell accordingly.

The task of setting up a program for reestablishing America's position in world aviation is much too large for any one industry, airline, or organization to attempt. Aviation policies now have impact in political fields and are becoming important foreign relations tools. It therefore seems wise to look for leadership in this regard from government, notably the Federal Aviation Agency.

The US is also committed to work through the United Nations and the ICAO. It would be advisable to determine what can be done to step up programs in both bodies. All members of these organizations must work together to meet the possibility of Russia's moving to disrupt or seriously endanger present world aviation treaties.

Unless action along these lines is taken, Aeroflot and the Russian aviation industry that stands behind it could give us new cause to recall Premier's Khrushchev's declaration of "economic war."—END

rtainly, my dear, if one likes to gamble,
e flies to Las Vegas. If one doesn't, one
flies to Southwest Airmotive. My good friend,
Mr. Baggersly, says Southwest Airmotive
service is known as
SOUTHWEST AIR
*Parts Distribut
City, St. Louis
Aircraft Sales Co

A serious student of air transport, Miss Porch flew 3,000 miles in the USSR on Aeroflot, gathering material for her master's thesis at the University of Denver. She has worked in flight safety for United Air Lines, has served as a Link trainer instructor, and is presently a naval Reservist.

Who is your Standard Brandsman?

A civilian, sure, but one who understands the unique problems of non-appropriated fund feeding activities. That's why he's particularly equipped to help with the job of running officers' and NCO open messes, as well as base exchange restaurants.

You'll find the Standard Brandsman an unlimited source for ideas that have proved successful in civilian hotel and restaurant operations. He'll gladly share them with you. For with the Standard Brandsman, service is a point of pride. Service which includes suggestions on how to make your food activities more profitable and *direct delivery* to reduce your operating inventory.

As part of the largest field staff ever to serve military food operations, the Standard Brandsman is within range of every domestic base and air field. He makes regular calls at your base to bring you the quality products, the tremendous service facilities of Standard Brands.

CHASE & SANBORN COFFEE
TENDER LEAF TEA
ROYAL PUDDINGS & PIE FILLINGS
ROYAL GELATIN DESSERTS
FLEISCHMANN'S SHORTENINGS
ROYAL SOUP BASES
BLUE BONNET MARGARINES
ROYAL INSTANT COCOA
FLEISCHMANN'S SALAD DRESSINGS

Honeywell puts man in space –at zero altitude

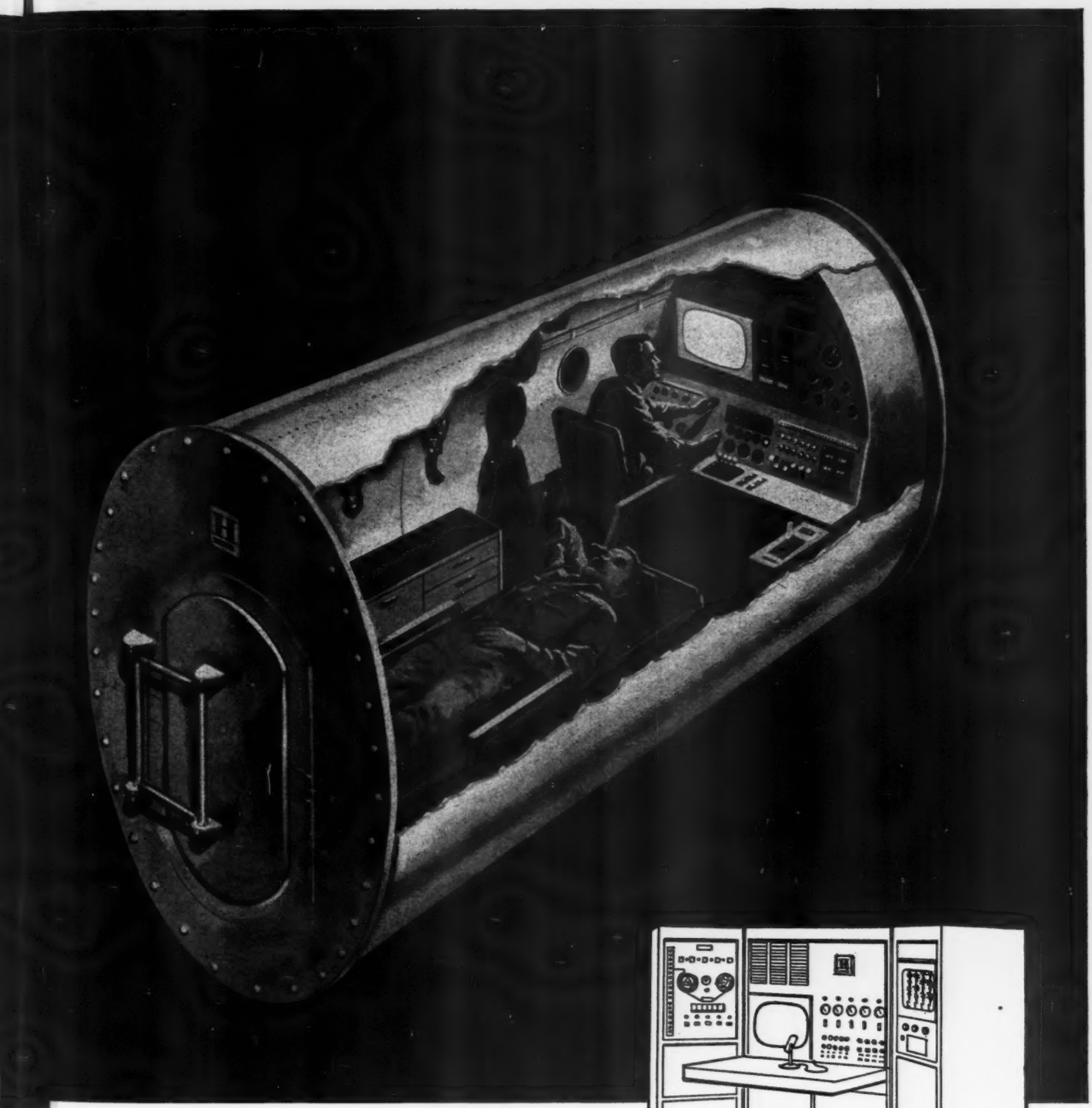
Advanced space environment simulator will isolate two men in Honeywell-controlled space flight environment during unprecedented 30-day test

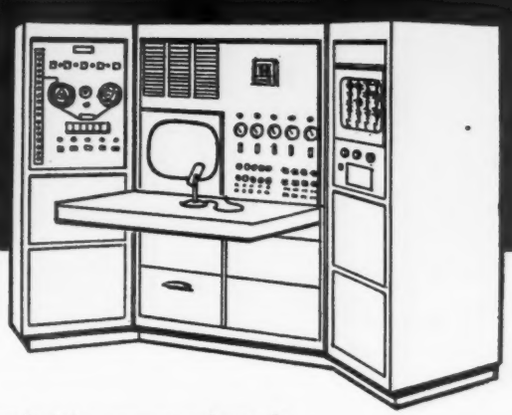
AS ANOTHER step toward man's conquest of space, Honeywell will provide the USAF School of Aviation Medicine with an environment simulator for use in researching human reaction to isolation in space. The test capsule developed by Honeywell will hold two men and all the life-sustaining materials they need for 720 hours. It provides a completely self-sufficient environment contained in a 12- x 6- x 5-foot package. When man travels space, the air he breathes, the food he eats, temperature control, waste disposal, and all other basic elements must be precisely planned and controlled. This poses intricate problems involving toxic gas, filtration, oxygen, lighting, and many others. In solving them Honeywell utilizes advanced engineering techniques developed during more than 70 years of leadership in environmental control.

Honeywell Capability

Human environment, however, is only one of many fields in which Honeywell can demonstrate space-flight capability. For example: *Guidance and Stabilization.* Honeywell's reference system is a remarkably accurate means of missile guidance and control proved in actual applications. *Flight Control.* Honeywell has more experience in the field of flight control than any other company. Proved systems include autopilots, reaction controls, jet vane controls, thrust vector controls and automatic landing systems. *Data Processing.* Honeywell capability includes sensing, recording, transmitting and interpreting. *Ground Handling.* Some of the most extensive and complex work done by Honeywell in the missile field concerns the development and operation of test and checkout equipment. This work includes depot overhaul and maintenance equipment, base level overhaul and maintenance equipment, and launch site checkout equipment. Additional Honeywell experience includes instruments, auxiliary airborne power systems and research into human factors, both biochemical and psychological.

If you have a problem in the design of systems or components in the field of space flight, call or write Honeywell, Military Products Group, 2753 Fourth Ave., South, Minneapolis 8, Minnesota.





Exterior console, right, presents and records data concerning conditions inside the capsule. Permanent records will be kept by audio recording, TV kinescopes, and camera equipment.

Two-man hermetically-sealed space cabin simulator. The basic chamber of the simulator will contain equipment that would be found in actual space flight. Oxygen, carbon-dioxide, toxic gases, temperature and humidity are constantly and individually sensed and compared to a set value. When safety limits are exceeded an error signal is amplified and corrective action is automatically begun. A sufficient water supply and facilities to insure personal cleanliness will be provided. Ample storage facilities for nonperishable foodstuffs will be provided for the 30-day isolation.

Honeywell

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The READY ROOM

RESERVE AND AIR GUARD NEWS

Lewis S. (Pinky) Thompson has been named Special Assistant to the Secretary of the Air Force for Manpower, Personnel, and Reserve Forces. He thus succeeds to most of the functions, if not the title, vacated by **Assistant Secretary David S. Smith** when the Air Force abolished the latter's post under the Defense Reorganization Act.

Thompson cannot assume statutory responsibility for administering the Air Reserve Forces. Title 10, US Code, states (in Sec. 264b) that "responsibility for supervising the activities of the Reserve components" will not be delegated below the level of Assistant Secretary. So, Thompson's work with the Reserve Forces will be supervised by **Under Secretary Malcolm A. McIntyre.**

Ben Fridge, Mr. Smith's Deputy for Reserve and ROTC Affairs, now becomes a deputy to Thompson.

Thompson, 54, has been with USAF since 1954 when he was appointed **Deputy for Military Assistance Programs** to the Assistant Secretary for Materiel. A native of New York and graduate of Princeton, he was with Standard Oil before entering government service in 1941 with the War Production Board. In 1943 he became executive officer of the Mission for Economic Affairs in London and US representative on the Combined Production and Resources Board. He returned to private life in 1947, but three years later took on a two-year stint with CIA. In the 1952 presidential campaign he was associate director of the Eisenhower-Nixon research service, and later formed **Research Associates, Inc.,** which he headed until he accepted the Air Force post in 1954.

* * *

Last month, in commenting on the **decreasing chances for promotion of field-grade Reserve forces personnel** on active duty, this column remarked that half the officers on active duty are now Regulars. A tabulation of USAF officer personnel figures show **how critical the situation really is** in field grades:

Grade	Regulars	Non-Regulars
General	12	0
Lt. Gen.	25	0
Maj. Gen.	164	5
Brig. Gen.	207	5
Colonel	4,280	376
Lt. Col.	7,206	2,590
Major	11,011	11,442
Captain	13,288	28,659
1st Lt.	6,981	31,131
2d Lt.	1,349	10,600
Totals	44,523	84,808

* * *

The **Air National Guard** will be given an **opportunity to prove its ability** to handle the **Bomarc** air defense missile. In a letter to **President Peter Schenk** of the Air Force Association, **Benjamin W. Fridge,** Deputy for Reserve and ROTC Affairs in the Office of the Secretary of the Air Force, reported that USAF has authorized a **"pilot" Air National Guard Bomarc site,** to be activated after USAF has gained operational experience with the missile.

"Provided the pilot operation is successful," Fridge wrote, "determinations will then be made in the light of over-all air defense requirements as to **whether additional Bomarc units will be manned** by ANG personnel."

Fridge **commended the AFA's interest** in the program. It was **AFA's Air Guard Council** which **first proposed ANG participation in Bomarc** in a resolution to the Air Staff.

Thirteen Air Reserve and **ten Air Guard** officers have been **recommended for general officer** promotion as Reserves of the Air Force, but as this issue went to press the **Senate had not yet acted** on their nominations. They were these:

For **Major General:**

Maj. Gen. Clyde H. Mitchell, Commander, Rome, N. Y., Air Depot.

Maj. Gen. Walter I. Miller, DCS/Comptroller, USAFE.

Brig. Gen. John R. Alison, Commander, 452d Troop Carrier Wing, Calif.

Brig. Gen. William S. Johnston, mobilization assignee as Deputy for Operations, Hq. TAC.

Brig. Gen. Clayton Stiles, Commander, 514th Troop Carrier Wing, New York.

For **Brigadier General:**

Brig. Gen. Theodore G. Kershaw, Commander, 464th (active) Troop Carrier Wing, Pope AFB, N. C.

Col. John S. Bagby, Commander, 512th Troop Carrier Wing, Pa.

Col. Charles F. Blair, Jr., assigned as Deputy Chief, Training Division, Directorate of Operations, Hq. SAC, Offutt AFB, Neb.

Col. Barry Goldwater (US Senator from Arizona), assigned as Assistant Director for Military Personnel, Hq. ADC, Ent AFB, Colo.

Col. John B. Montgomery (former USAF Maj. Gen.), assigned as Deputy Commander, Second Air Force, Barksdale AFB, La.

Col. Frank S. Perego, assigned as Chief, Tactical Air Division, DCS/Development, Hq. USAF.

Col. Roy T. Sessums, assigned as Director of Research & Development, AF Missile Test Center, Patrick AFB, Fla.

Col. James Stewart, assigned as CofS, Fifteenth Air Force, March AFB, Calif.

Generals **Mitchell** and **Miller** are on active duty in the temporary grade of major general, while General **Kershaw** is on active duty as a brigadier general. The others are Air Reserve commanders or mobilization assignees.

Air Guardsmen were accorded federal recognition in their state status, enabling them to wear the new insignia while awaiting Senate confirmation in their Reserve of the Air Force status.

Nominated for **Major General, ANG,** were:

Brig. Gen. Howard W. Butler, Chief of Staff, Tennessee ANG.

Brig. Gen. Lewis A. Curtis, Commander, New York ANG.

For **Brigadier General:**

Col. Raymond L. George, Chief of Staff, New York ANG.

Col. Howard T. Markey, Commander, 126th Air Defense Wing, Illinois ANG.

Col. Bernie B. McEntire, Jr., Chief of Staff, South Carolina ANG.

Col. Williard W. Millikan, Commander, 113th Tactical Fighter Wing, District of Columbia ANG.

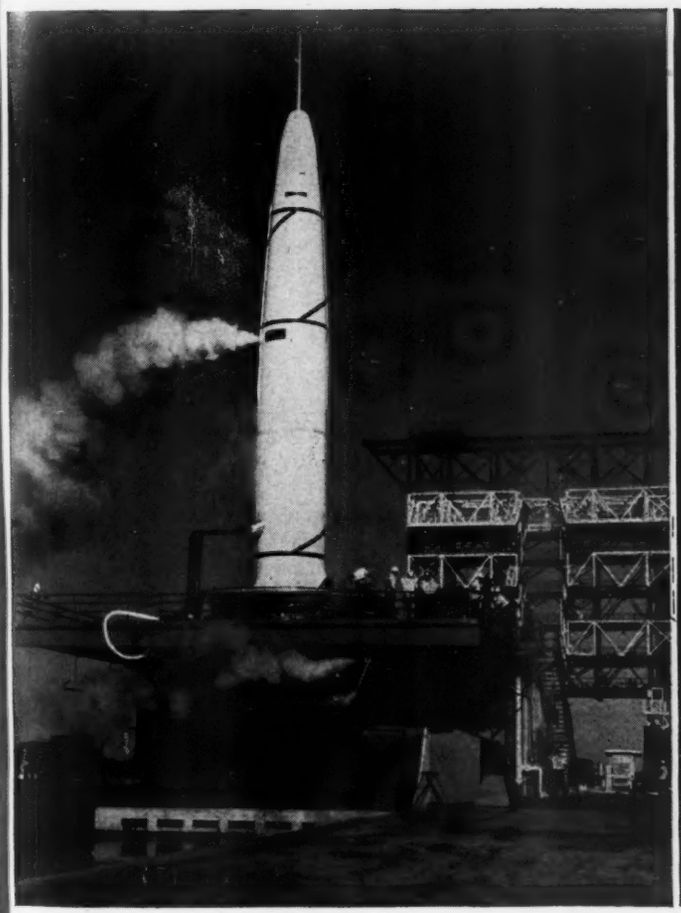
Col. William R. Sefton, Commander, 122d Tactical Fighter Wing, Indiana ANG.

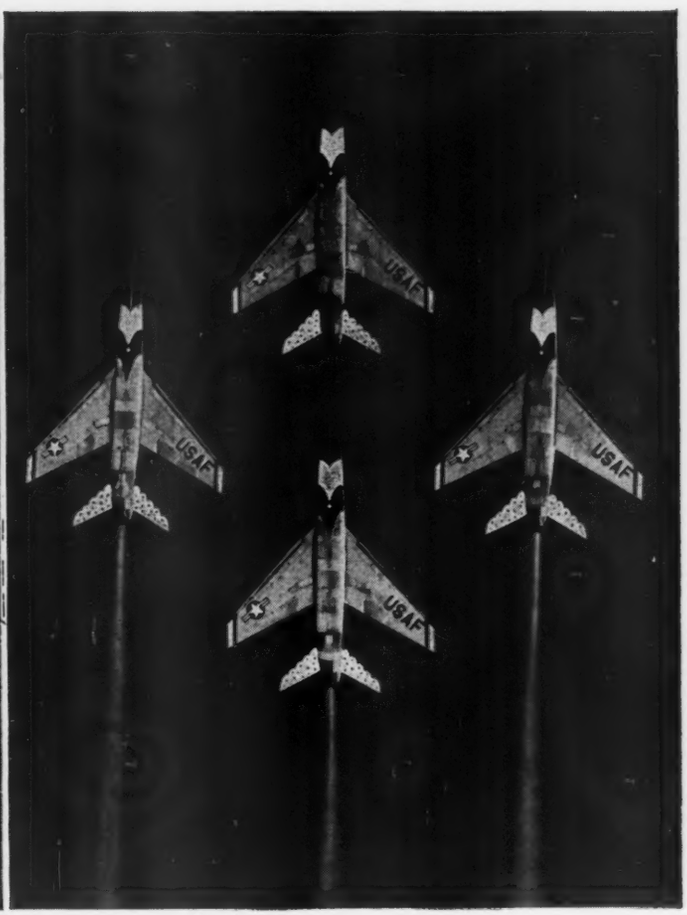
Three Assistant Adjutants General for Air were nominated for one-star rank for tenure of present office only. They were Colonels **Ross C. Garlich,** Missouri; **Jack Parsons,** Alabama; and **Jack W. Stone,** California.

(Continued on page 149)

Why make a career of the Air Force?

General Thomas D. White
Chief of Staff
United States Air Force





A message to young Air Force officers

The choice of a career is one of the most critical decisions a man must face in his lifetime. For, to be truly successful in his field of endeavor, he must and should approach it with a career attitude—not merely as "taking a job."

This attitude encompasses many implications. It is concerned with ten to thirty years from now, as well as tomorrow. It is concerned with personal satisfaction, as well as material reward. And, most important, it is concerned with the challenge, the stimulation and ultimate fulfillment of a life devoted to the work a man likes—work that is worthy of him.

Many young men may not fully realize the importance and individual satisfaction of being a member of the first team. The young man choosing a career as an Air Force officer joins a team dedicated to the preservation of the American way of life. He serves his country in the first line of defense, operating the finest equipment which the combined efforts of American science and industry can provide. Yet, *he* as an individual will always be the most important element of the USAF.

He *must* recognize, however, that in the ever-increasing complex of a global organization—charged with the mission of peace in the world—only the most able, the most imaginative and most dedicated men can do the job.

In this highly technical and competitive world that daily pushes the last frontier further and further into space, few professions provide the comparable excitement, varied experience, pride and deep gratification of service to country that are the rewards of the young Air Force officer. I commend the Air Force to the qualified young man as a career.

What is your altitude?

The Bulova Aircraft Altimeter presents the answer clearly, accurately . . . instantly!

Direct reading from a tape presentation eliminates misjudging pointer position and two or three pointer scanning. With an instrument error of less than 10 feet at sea level, 20 feet at 20,000, 50 feet at 40,000, the Bulova Altimeter is an important *advance* in flight safety. During actual flight tests, pilots report no difficulty in making accurate, split-second readings during rates of change of altitude exceeding 25,000 fpm. In flight evaluation, military, airline and airframe company test pilots flying high performance jet and reciprocating engine aircraft have enthusiastically responded to the faster, error-free readings possible with the Bulova Altimeter. For detailed information about the Bulova Altimeter, write —

Industrial & Defense Sales, Bulova, 62-10 Woodside Ave., Woodside 77, N. Y.

BULOVA

"Visit our booth, #247 at The World Congress of Flight, Las Vegas, Nevada"

READY ROOM——CONTINUED

Col. **Walt Williams,** who had led the **Colorado Air Guard "Minute Men,"** official ANG jet demonstration team, since it was formed shortly after World War II, turned over **team leadership** on March 1 to **Capt. Bob Cherry,** wartime fighter ace, who has flown left wing on the team for years. Colonel Williams, who won high team captain honors in USAF's 1955 fighter-gunnery meet, will devote full time to his duties as commander of Colorado's 140th Fighter Group.

• • •

AFA's Reserve and Air Guard Councils will meet in Las Vegas this month during the **World Congress of Flight.** Chairman **Roy T. Sessums** (see general officer promotion list above) will convene the **Reserve Council** at the Thunderbird Saturday evening, April 11, while the **Guard Council** under **Col. Bob Campbell** will meet at the Riviera Hotel on Thursday, April 16.

Although the **Air Reserve Forces Policy Council** has shifted its meeting to Washington, May 4-6, most of its members will be in Las Vegas. ARFPC will take time out during its May meeting to attend the Air Proving Ground firepower demonstration at Eglin AFB, Fla., on May 5.

• • •

When and where **Air Guard flying units will go for field training** this summer has been **announced by the National Guard Bureau.** Most Guardsmen will go to the usual **eight permanent field training sites,** but **sixteen squadrons or groups will train at home.**

Of the Air Guard's **twenty-four combat wings,** only **eight will actually go to camp intact.** The wings with this homogeneous spirit are all earmarked for assignment to Tactical Air Command. Four other wings **with TAC missions** would probably be together as well, except for special situations.

In contrast, none of the twelve wings assigned to **Air Defense Command** will train as units. This is understandable, since interceptor outfits are expected to operate on their own, under Air Division rather than wing control, in an emergency.

The **144th Air Transport Squadron** of Anchorage, Alaska, leads off the training schedule on May 23, staying at home. First to embark for camp is the **119th Fighter Group of Fargo, N. D.,** which reports to Volk Field, Wis., on Memorial Day. Last units will return home from field training on **September 5.**

(Continued on following page)

CAE...

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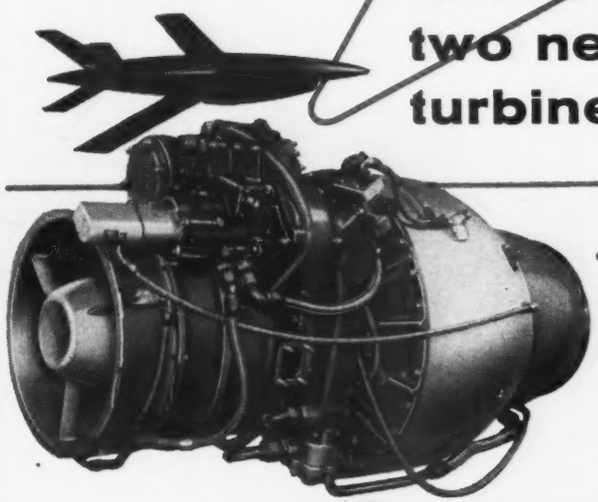
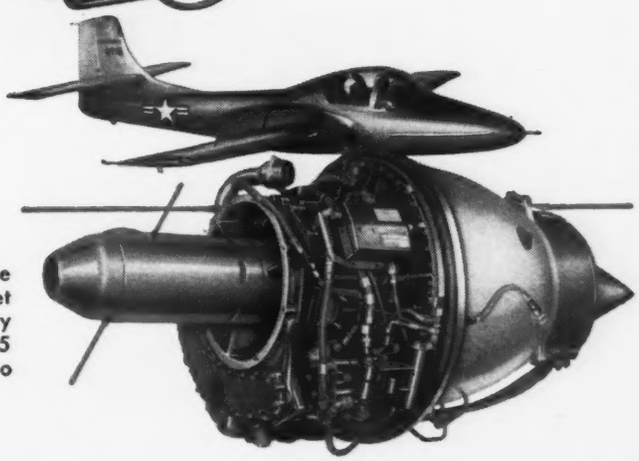
Announces two new turbines



J69-T-29A

1,700 lb.-thrust model for drone applications. The new engine has 60% more thrust with only a 6% increase in weight. It is presently powering the Ryan Q-2C target drone which recently underwent successful flight tests.



J69-T-25

Latest power plant for the Air Force T-37A twin-jet trainer manufactured by Cessna, the J69-T-25 has increased thrust to 1,025 lbs.

CAE has more than 10 years of turbine engine experience in the medium and low power range. The Air Force MA-1A trailer-mounted turbine air generator manufactured by CAE is on duty at air bases the world over, demonstrating outstanding performance and reliability.

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Incidentally, this year may be the last as training sites for **Syracuse, N. Y., and Casper, Wyo.** Casper would have been out this year except for heavy congressional pressure. Units training there must go to **Wendover AFB, Utah,** to practice air-to-air rocketry, because the old Split Rock, Wyo., range is now thick with uranium prospectors, ranchers, and new home sites. Syracuse has **no air-to-ground range,** needed since New York's 107th Wing has converted to a tactical fighter role. Besides, Air Defense Command wants to take over the federally owned property there to expand its operations.

No new site has yet been tagged to replace Syracuse, but Wendover looks like the logical replacement for Casper. It has everything a unit needs at summer camp—barracks, office space, maintenance facilities—plus its huge range and a full-time Air Guard GCI squadron. But Guardsmen will miss Casper's warm hospitality, including the free venison barbecues put on by its townspeople.

• • •

An Air Guard **flying safety and commanders' conference** has been scheduled for April 21-23 at **Ellington AFB, Tex.** About 350 are expected to be present, including state adjutants general, chiefs of staff for air, wing, group, and squadron commanders, and flying safety officers. Commanders of USAF gaining commands—**ADC, TAC, MATS**—have been invited, as have **top CONAC commanders,** the chief of Air Force **flying safety,** and aircraft **industry representatives.**

• • •

Official confirmation is expected shortly on appointment of **Maj. Gen. Clarence A. Shoop,** chief of staff of the California Air National Guard, to succeed the late **Brig. Gen. George R. Dodson** of Oregon as chairman of the **Air National Guard Policy Council.** As the ranking member, General Shoop would also become chairman of the parent Air Reserve Forces Policy Council.

• • •

The second annual **Air Reserve Forces Seminar** will take place in Washington September 24-25. In inaugurating the seminar last year, **Gen. Thomas D. White,** USAF Chief of Staff, expressed the desire that it be made an annual event, a sentiment endorsed by all of the participants.

About **235 members of the Reserve forces** are to be invited, based on nominations by **CONAC, major commands, and state adjutants general.** They are to include individuals, regardless of rank, who are outstanding in community activities. Those who attended last year will not be eligible.

• • •

A theoretical **"little war" situation** is the basis for **Operation "Pine Cone II,"** a **joint air-ground exercise** in the Fort Bragg, N. C., area May 23 to June 7. Billed as the biggest test yet of Air Reserve forces combat readiness, the exercise combines **active Army airborne troops with Air Reserve and Air Guard units** under **Tactical Air Command control.**

• • •

Brig. Gen. Ramsey Potts, Commander, 459th Troop Carrier Wing, Andrews AFB, Md., will head a **200-plane troop carrier force** of C-119s and C-123s while **Brig. Gen. Charles H. DuBois, Jr.,** who commands the 131st Tactical Fighter Wing, Missouri ANG, will direct a **composite ANG-USAF tactical force of 100 or more F-84Fs, RF-84Fs, and F-100s.**

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Aggressor terrain and positions are open secrets to TI-equipped recon drones and snooper aircraft. Field commanders can now reconnoiter "in person" far behind aggressor lines *without leaving field HQ.* Instant, accurate, continuous data on thousands of sq mi of hidden territory can flow into headquarters *in the time one foot patrol could complete its mission.* Hundreds of targets can be spotted, evaluated and brought under fire in the same time interval . . . most of them within seconds after detection.

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Lockheed's Hercules takes U.S. based troops

Any place on Earth in 1½ days

The Jet Age's first strategic/tactical transport, the new Lockheed C-130B HERCULES, is the only U. S. Air Force plane designed specifically to airlift battle-ready troops, equipment, and supplies from the U. S. to any area on earth in 36 hours or less—then para-drop them into battle zones or land with them on short, rough fields, sand, snow or ice.

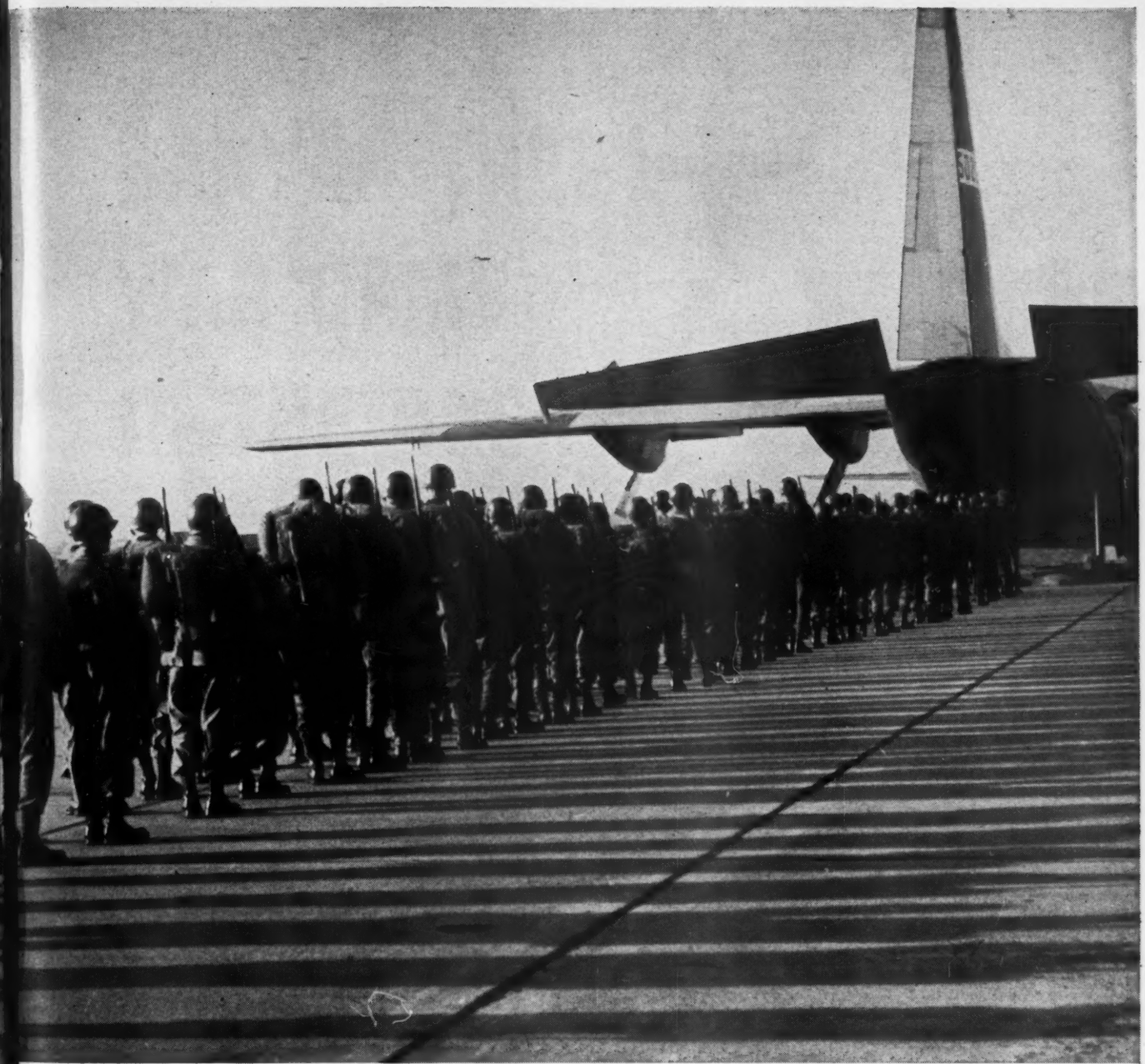
The C-130B HERCULES is a huskier, more powerful, longer range version of the C-130A HERCULES—which in two years of world-wide service with the Air Force has become the unchallenged Champion of the U. S. Strategic Airlift.

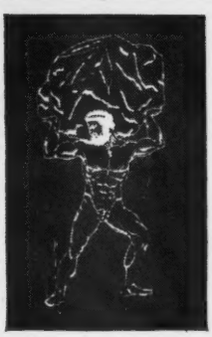
Now coming off production lines at Lockheed's Georgia Division, the new C-130B HERCULES will soon enter service with the U. S. Air Force's Tactical Air Command.

Takeoffs from deep sand averaged only 1500 feet in a C130A at 110,000 pounds gross weight. With same load it landed on sand and stopped in less than 950 feet.

Landing on frozen lake, "Ski-130" (weighing 62 tons gross) stops in 1200 feet. Taking off from same lake, this ski-fitted Airlift Champion was airborne in 2100 feet.

20 tons of pallet-loaded cargo can be winched in or out of the C-130 in 40 seconds. HERCULES can land, unload 20 tons reload 20 tons, take off in 20 minutes—saving 2½ hours.





The C-130 HERCULES transports 92 battle-ready troops, or 64 fully-equipped paratroops —and holds the world record for the heaviest parachute-extracted drop: 30,370 pounds.

C-130B Hercules Specifications: Wingspan, 132.6 ft. Length, 97.7 ft. Cargo volume, 4300 cubic ft. Gross weight, 135,000 lbs. Engines, 4 GM-Allison 4050 eshp Prop-jets.

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'BANYAN TREE'... WAR GAME IN THE BUSH

A certain air of unreality was evident in the recent maneuvers held in the Panama Canal Zone

Claude Witze
SENIOR EDITOR

Eight hours after he came aboard at Fort Bragg, Army jumper prepares to leave C-130 for the Panama "war."

ALBROOK AFB, CANAL ZONE

BACK in 1944, when the nation was at war without benefit of jet airplanes, missiles, or nuclear weapons, the old Army Air Forces Materiel Command held its first press tour of facilities at the then unhyphenated Wright Field. We were there, opportunely, on June 15, when the B-29s made their first bomb run over Japan. Somehow, halfway around the world from the scene of action, that day in Dayton we seemed very close to the Imperial Iron and Steel Works at Yawata, Kyushu. That's where the bombs went off.

In fact, I felt a lot closer to Kyushu on June 15, 1944, than I did to Exercise Banyan Tree on February 19, 1959, and this time I was an eyewitness. Perhaps it was the trucks from which coffee and cold drinks were being served, or the festive air—like that of the old Cleveland Air Races—complete with grandstands, loudspeakers, heat, and traffic jams. It remains that war games on the land, on the sea, and in the air never seem very real. There is almost nothing unexpected.

In Banyan Tree one man fell out of his C-130 before it reached the drop zone. He landed in the Pacific and was never seen again. There was a minor revolution under way in Panama City, and all hands taking part in Banyan Tree were confined to the military posts for about twenty-four hours while the Latin blood cooled off. Otherwise, little took place that was not in the Exercise Banyan Tree scenario.

The scenario said the situation assumed the United States was at war with an aggressor who had designs on Central America and, specifically, the Republic of Panama. There was an "invasion," and a couple of days later, on February 17, the Joint Chiefs of Staff ordered the Army and the Air Force to reinforce the unified Caribbean Command. About twenty-four hours later USAF was ready for action, and in North Carolina paratroops were being loaded for an H-hour drop at 7:30 in the morning on February 19.

At Albrook AFB in the Canal Zone there was a harsh touch of reality that morning, particularly for the newspapermen brought in from their comfortable beats up Stateside. We were roused from our quarters at 3 a.m., had a quick breakfast at the Officers' Club, and moved by bus to a runway. It still was dark. We were loaded into C-123 assault transports for a half-hour flight to the drop zone at Rio Hato, about seventy-five miles away. By lucky circumstance, right next to the DZ there was an airstrip, a blacktop with tufts of jungle grass growing through the cracks, left over from our World War II complex. We boarded another bus, a balky one, and bumped over the dusty terrain to a grandstand. The DZ was a big clearing, not far from the Pacific shore. It is on the edge of the jungle, with tall grass, short grass, some brush, and tree groves along the edge.

Announcements were made over a public address system in English and Spanish, the latter for the benefit of large delegations from South and Central American republics. A B-57 swept across the field and dropped a simulated atomic bomb. This was at 7 a.m., and it was assumed that the

(Continued on following page)

Maj. Gen. Hamilton H. Howze, commander of Army's 82d Airborne Division, makes report on his flight to fellow officers at the drop zone at Rio Hato. His biggest complaint: the heaters didn't work. He was the first of 1,300 to jump.

radiation peril would be dissipated within thirty minutes, a conjecture that much of the press greeted with skepticism. At 7:30 the drop was under way, right on the schedule given in the scenario.

First man out of the C-130s when they hit Rio Hato was Maj. Gen. Hamilton H. Howze, commander of the 82d Airborne Division. He became familiar to every Pentagon reporter during his recent tour as Chief of Army Aviation. General Howze was not in command of his Combat Team 2/501—that job was filled by Col. Royal R. Taylor—but he led the men on the jungle drop, his fifteenth jump with the troops. Like the winner of the Thompson Trophy or the Bendix cross-country event at Cleveland, the general moved from the drop zone to the press section of the grandstand. He was natty. Even the battle garb, which leaves most men looking like an unmade bed, was as clean and sharply pressed as a tuxedo.

General Howze has a dry, unemotional approach to the facts, sounding like Elmer Davis in paratroop boots and helmet, complete with solid chinstrap. I doubt that he removed the helmet or loosened a belt until he turned in at his quarters later in the day. His only complaint was that the heater had not worked properly in his airplane. The flight had taken more than seven hours, and it was more than eight since the soldiers loaded at Fort Bragg for the 2,000-mile ride to Rio Hato. A substantial number of the 1,300 men had to do jigs and massage each other with their fists in order to keep warm at 20,000 feet, for General Howze's C-130 was not the only one with defective heating. When they jumped there was a sharp change in temperature as they hit the DZ where the mercury was above ninety degrees.

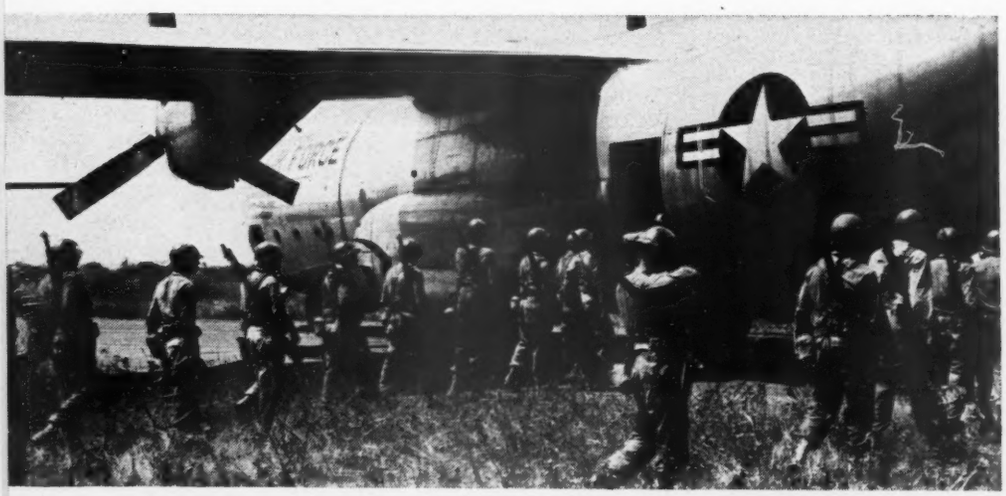
Given an aircraft with the range, General Howze could see no reason why the men could not fly fifteen hours before the jump. He did not speculate on how proficient they would be for battle after that many hours in the air. But he was proud of the fact that the haul from Fort Bragg to Panama was the longest paratroop hop since the invasion of North Africa in World War II. The commander of the 82d indicated his biggest disappointment in the Banyan Tree scenario was the fact that his assault helicopters were left at home. The Navy was unable to provide sea transportation for them to supplement the drop strength of Combat Team 2/501. The last time I saw the assault helicopter was at Exercise Sagebrush in Louisiana in 1955. They were operated by the Air Force at that time, and Army personnel flatly refused to ride in them.

The drop, which continued while General Howze faced the press, was routine. There were fifty-five to sixty men in each of the twenty-three C-130s. They came from the 839th Air Division of the Tactical Air Command at Sewart AFB, Tenn. The planes made three passes over the DZ at 1,200 feet, discharging a third of the load on each trip. This cut down dispersal. They had a half-hour to clear the area. Then three more C-130s appeared and dumped the heavy equipment—two 105-mm. howitzers, two three-quarter-ton trucks, and two 6,000-pound combat load packages.

Aside from the man who fell in the ocean there were no fatalities, but thirty-nine troopers wound up in the hospital. There were four fractures, twenty-four minor sprains, seven cases of contusions and abrasions, two heat prostrations. One man developed appendicitis in the DZ; another had shoes that didn't fit and was carried away with a bad case of blisters.

The work of the C-130s—the planes were able to land conveniently at Albrook—was augmented by the speedy landing and discharge of other equipment from C-123 assault transports. They made a hop of only seventy miles, from Howard AB, a

(Continued on page 159)



This was the pastoral scene as the Army's Combat Team boarded transports at the Fort Bragg home base. Up to sixty paratroopers were carried in each TAC aircraft.

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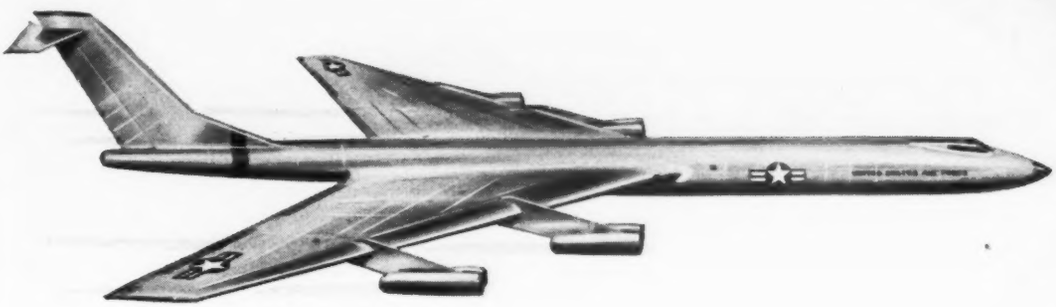

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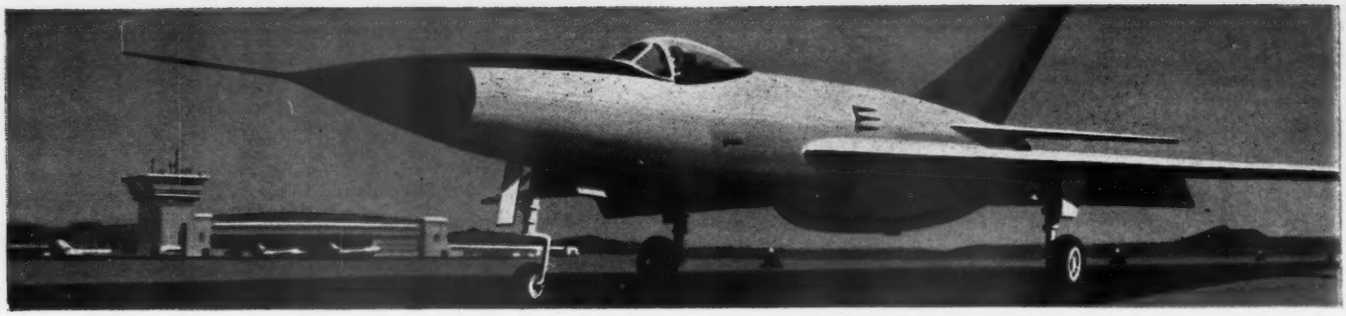

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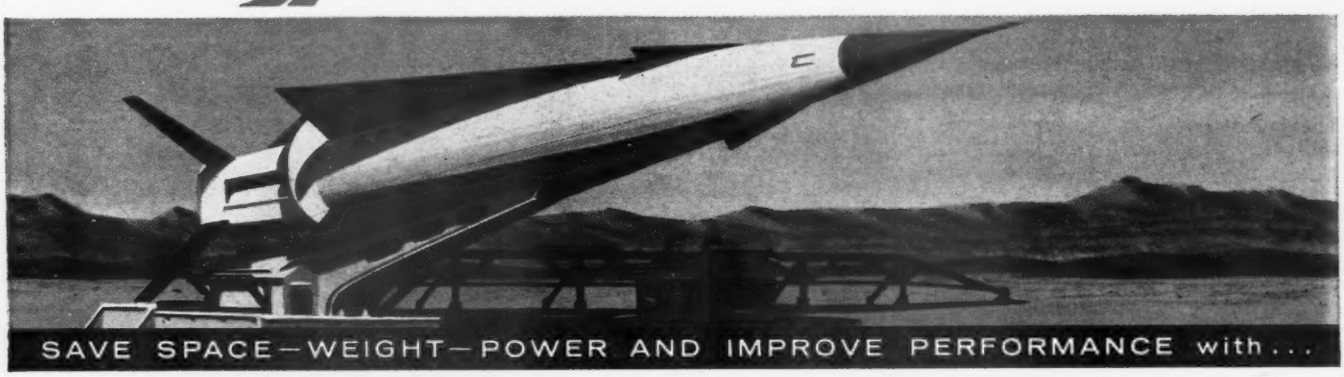

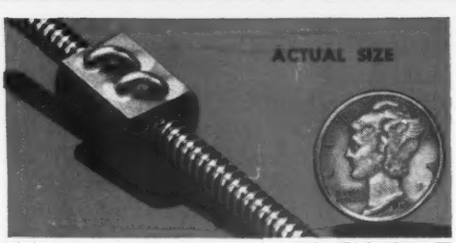

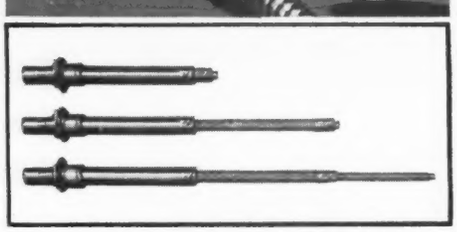

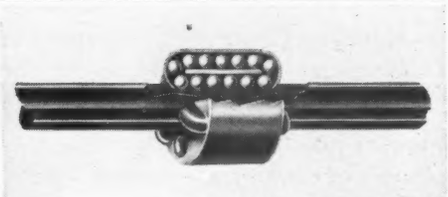

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neighbor of Albrook's in the Canal Zone. There were fifty-six C-123s in Exercise Banyan Tree, all from the 464th Troop Carrier Wing, Medium, TAC, Pope AFB, N. C. Everything they unloaded was on wheels and scurried off through the dust in one direction while the C-123s plowed the other way. The planes landed, taxied to the side, disgorged, taxied back, and left the bumpy and unpaved ground like a lot of clumsy trucks on wings. The C-123 may be the most unphotogenic but most efficient airplane for its job in the USAF inventory.

There were Aggressor forces in Exercise Banyan Tree, but I don't think anyone saw them in action. They were unrealistic, too. It was assumed they had a force about half the size of the American force and that it was landed after a submarine missile attack on the Canal Zone. How did the Aggressor troops get there? From troop-carrying submarines that put them ashore in the Rio Hato area, it was assumed in the Banyan script. It was the first use of underwater transport this reporter could remember since the *Deutschland* brought cargo to the US in the early days of World War I. It was further assumed that the Aggressor had vehicles and heavy equipment brought in by transports disguised as merchant ships. There was no explanation of why neither the submarines nor the merchant ships were considered capable of disgorging any type of atomic weapon on the jungle beachhead. On the other hand, the Aggressor was credited with having three T-33 aircraft, presumably for reconnaissance. If this activity was successful, one of the most important things it would presumably turn up would be targets for nuclear weapons. An obvious one would be the drop zone itself, about forty-five minutes after General Howze reached the press gallery.

What took place on the battlefield after the assault by 1,300 paratroops fresh from the United States was not seen by any of the witnesses. According to the scenario, fighting at the airhead was fierce, but our positions were stabilized by four o'clock in the afternoon. By that time the press corps was back in the sack at Albrook, except for the eager beavers who wanted to cover the "revolution" in Panama City. The next day, D-plus-one, found Combat Team 2/501 fighting to fix a break in the line that the Aggressors had effected during the night. This was done with the help of TAC dropping atomic weapons and through use of Honest John rockets, brought in on the first day by the C-123s. Aggressor points were seized, there were counterattacks, and fighting lasted through the second night. On D-plus-two we won the war, and the troop-carrier planes came back to shift soldiers for use somewhere else in the Caribbean theater. By that time the Panama City uprising was all over, Banyan Tree guests were doing the downtown gift shops and drooling over the low prices on scotch and bourbon.

Main section of Honest John rocket was unloaded from C-123 assault transport less than half-hour after drop. Everything was on wheels to speed up the action.

The Army used Exercise Banyan Tree most effectively to continue its sales pitch for STRAC (Strategic Army Corp), of which Combat Team 2/501 is a typical unit, ready to reinforce such commands as the Caribbean at short notice. STRAC posters were placed wherever a Banyan visitor could see them, postal cards were available if anyone wanted to send the STRAC message to the folks back home. STRAC, the Army preached long and loud, is strong, versatile, and a balanced force with real staying power. According to the Army, it is the "strong arm" to meet the threat of limited war.

Well, the Tactical Air Command had a Composite Air Strike Force taking part in Banyan Tree, too. It was evident in the list of forces handed out as a press release and in a glimpse of B-57 and F-100 aircraft over the drop zone before the C-130s and C-123s arrived. But this reporter was the only one out of three score who visited the Air Support Operations Center at Fort Amador, twenty minutes by staff car from Albrook.

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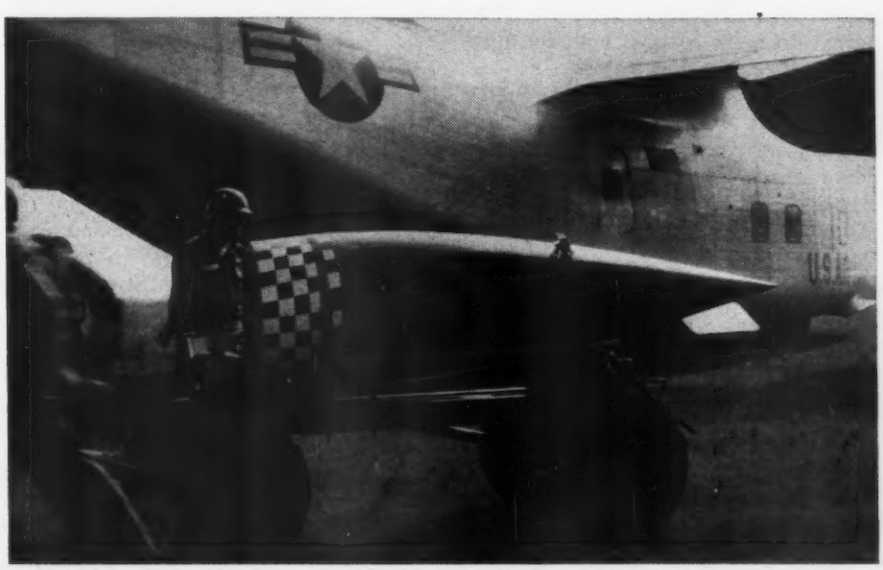


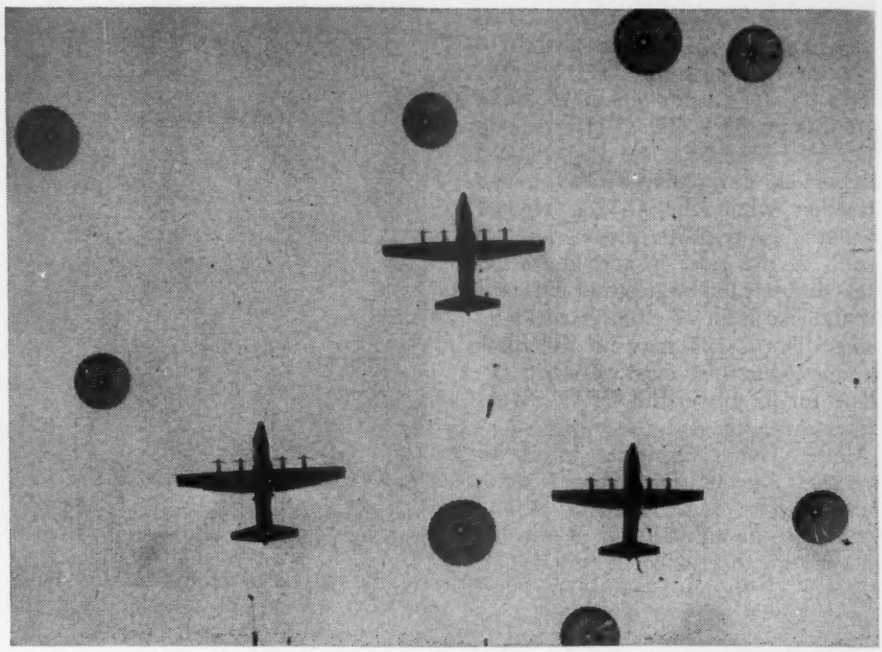
The rocket's nose, which can be nuclear-deadly, ready to roll. This version can be moved by helicopter, hence is called by Army people the "Chopper John."

The ASOC was under the command of Col. Timothy O'Keefe, commander of the 4th Tactical-Fighter Wing, out of Seymour Johnson AFB, N.C. At Homestead AFB, more than 1,000 miles away on the tip of Florida, he had fifteen of his F-100s and twenty-four aircrews. At Guantanamo Naval Air Station, in Cuba, there were twelve KB-50 piston-powered tankers from the 4505th Air Refueling Wing, Langley AFB, Va. Close by, at Howard AB in the Canal Zone, he had a dozen B-57 tactical bombers from the 345th Bomb Wing, also from Langley. All these units are part of the Ninth Air Force.

In a reverberating room on the second floor of an administrative building at Fort Amador—over the barber shop and next door to the chaplain—Colonel O'Keefe was bossing an air war with these scattered components. While loudspeakers blared messages from all points on land and cockpits in the air, his staff kept track of every move on charts that covered all walls. The flow starts with the battle group out on the field, which originates each request for an airstrike. It goes to The Army Operations Center (TAOC) which is in another office across the street. There, if it wins approval, it is passed on to Colonel O'Keefe.

If he determines that the strike can be carried out, he notifies the TAC fighter or bomber unit at Homestead or Howard. When it is a Homestead F-100 flight that is requested, he also must call on the tankers in Cuba. The KB-50s meet the fighters over the Caribbean and feed them when they are about two-thirds of the way to Panama. The planes, once over the target area, have about eighteen minutes to perform their mission. On the way back each fighter is refueled again from the tankers, which have waited for the return flight. From Homestead, a mission runs between five and six hours for the F-100. From Guantanamo NAS, the tankers are gone about seven hours.

The most impressive thing about this method of providing an air strike force is that it works under these circumstances. It was shown in Exercise Sagebrush in 1955 that an aggressor equipped with tactical air capability can raise a lot of hob and that air superiority cannot be retained in the face of an enemy who has bases from which to launch atomic attacks. Aggressor's lack of tactical air in Banyan Tree was an artificiality just as certainly as were his lack of nuclear weapons and his troop landings from submarines.



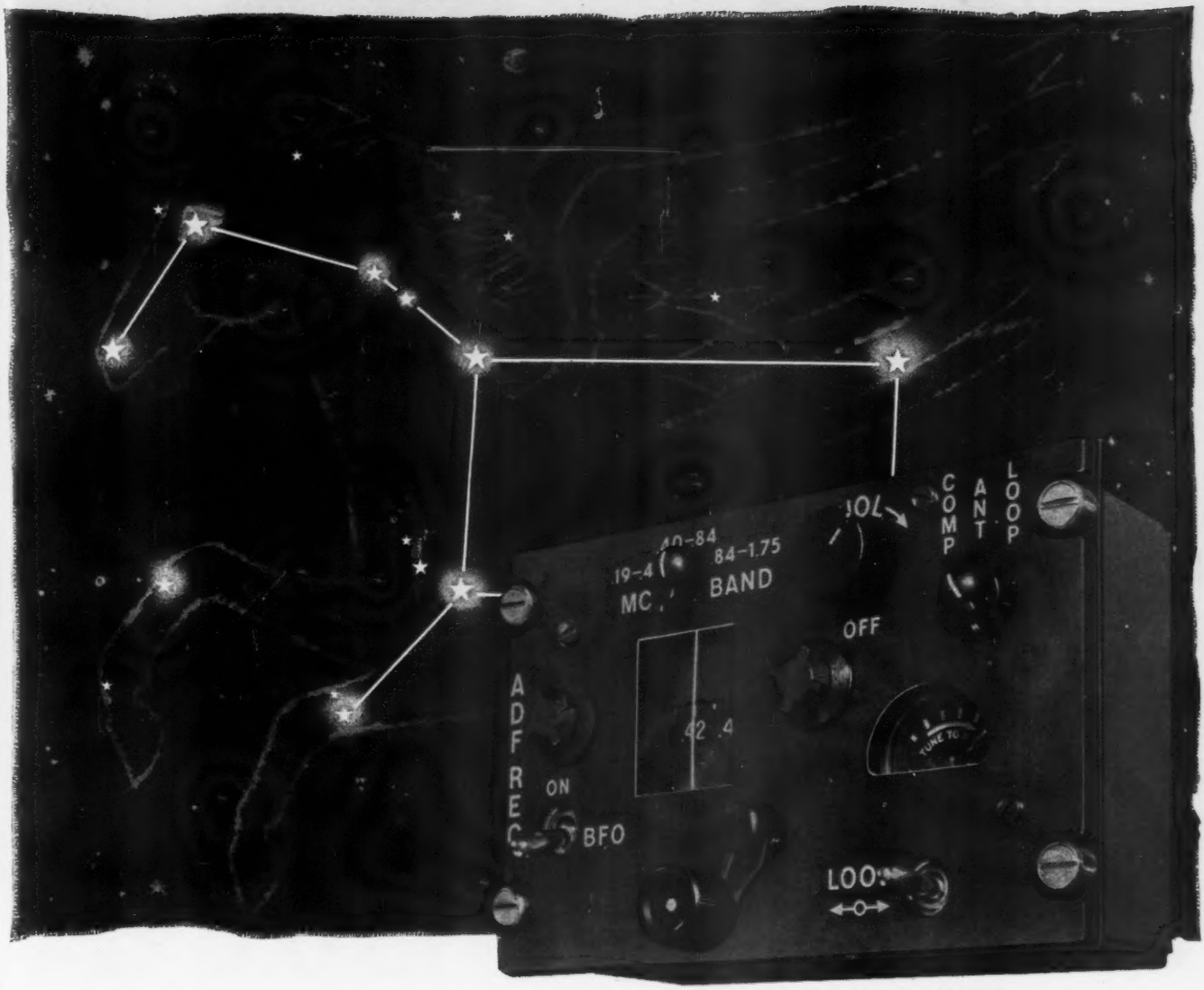
GIs float down to jungle "battle," as C-130s and 'chutes make pattern in sky.

Most TAC officers welcomed Banyan Tree as an exercise, but when I asked them what it proved about the utility of the Composite Strike Force they recommended that I write about something more realistic—the excursions of last year to Lebanon and Formosa. Colonel O'Keefe, who is a working man with a fighter wing to run, argued strongly that TAC has the most economical tools for fighting a limited war and the tools that can get there first with the biggest wallop. At the same time, the colonel and all his colleagues are deeply concerned about steady chiseling of the TAC budget—going down steadily at a rate of twelve percent a year.

What does TAC need most? Colonel O'Keefe had a quick answer: jet tankers. His F-100s are going to be phased out and replaced with the newer and faster F-105. The F-100, in his opinion, is the last plane he will have that can be refueled from piston-driven KB-50s. With the KC-135, now confined to Strategic Air Command missions, there would be little loss of speed, none of altitude, for the refueling operation, and the "buddy" system could be introduced in the interest of flexibility.

As long as the subject of Exercise Sagebrush has come up, this is the place to report that the atmosphere of flying sparks has disappeared since the Louisiana maneuver of three years ago. At Banyan Tree, where the boss was Army's Lt. Gen. Ridgely Gaither, there was every evidence that a unified command operation can and does work smoothly. General Gaither, whose command has been unified since 1947, says that the Reorganization Act of 1958 came in with no noticeable change in emphasis. Still, he has greater authority and full operational command over assigned forces.

Favorite subject of the press at every meeting with military brass was airlift capability. Army men were inclined to say, yes, they would like to have enough airplanes to move the entire 82d Airborne Division, but they accepted the fact that it's not a very practical idea. Maj. Gen. Robert F. Sink, top STRAC officer on the scene, said he is looking forward to transports with longer range—the new C-130B will have 3,300- to 4,000-mile capability—and that he would need about 700 planes to move an entire division. The Air Force was not well represented at this briefing, where Generals Gaither and Sink did an outstanding job, but a USAF colonel on the sidelines volunteered that 700 transports would create one hell of an air-traffic problem and a bigger one on the ground if they had to find a place to set down in some remote part of the world. How they would be serviced when they got there is a problem left for the natives. When it is done on a maneuver a few years from now, there will be gasoline and overhaul facilities waiting in the jungle. There is something unreal about that, too.—END



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The Vscope on the front of each equipment is shown here enlarged to improve readability. The Vscope at left shows a vertical disturbance of .187". The Vscope at right reveals no apparent motion due to the high isolation of the Robinson mounting.

12.0 "G" reduced to 0.6 "G"

This Is Environmental Protection!

Look at the above illustration, showing two Bendix air data sensors on an electromagnetic shake table. Notice the left hand unit which is mounted solidly to the oscillating head of the shaker. The image is blurred because a vibratory input of about .187" double amplitude at 35 c.p.s., equalling an acceleration force of 12 "g's", is being applied directly to it.

Now look at the right hand unit mounted on a Robinson engineered mounting system . . . some difference! The clear image of this equipment shows the typically high isolation efficiency (over 95%) of the Robinson MET-L-FLEX® mounting design.

Other Robinson designs provide similar protection at higher frequencies where the input often reaches 30-40 "g's". The natural frequencies of such mounting systems are held within limits which are not critical to the equipment.

Utilizing this mounting system radically reduces the environment to a level easily tolerated by any reasonably well designed electronic equipment. Such a mounting eliminates the need for costly and time consuming ruggedization. Over-all space and weight are held to a minimum.

Because of the proven performance and reliability record of airborne components *now* protected by Robinson mountings, an increasing number of manufacturers in the electronics industry are incorporating Robinson mountings as an *integral part* of their basic equipment design.

"Performance is the reason . . . Reliability the Result"

ROBINSON CONTROL IS RELIABILITY CONTROL

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AFA NEWS

SQUADRON OF THE MONTH

Greater Pittsburgh Squadron Cited for

outstanding planning and programming in the sponsorship of a program designed to better acquaint the community with the role of the various AF commands, and of the personnel assigned to them.

The **"Meet Your Air Force"** program of the **Pittsburgh Squadron** reported in this space last month is now AFA history. It was a thoroughgoing success.

The program brought top Air Force officers, including a number who call Western Pennsylvania "home," for **a round of "school-storming"** addresses and discussions to carry the Air Force story to local folk.

Highlight of the program was appearance of **a nine-man officer panel** before a packed Perry High School auditorium on February 20. **Some 600 persons**—teachers, students, local leaders, and average area residents—heard the AF group discuss their commands in personal terms.

The panel included: **Maj. Gen. Elvin S. Ligon,** Commander, 3500th USAF Recruiting Wing; **Brig. Gen. William L. Lee,** Commander, Amarillo AFB; **Brig. Gen. John Haton,** CONAC; **Col. Francis S. "Gabby" Gabreski,** Tactical Air Command; **Col. Albert Heineman, Jr.,** Pennsylvania Air National Guard; **Lt. Col. Joseph Tolbert,** Strategic Air Command; **Lt. Col. William A. Shomo,** World War II winner of the Congressional Medal of Honor, representing Air Defense Command; **Lt. Col. James D. Hunter,** Air Force Academy; **Lt. Col. Francis X. Kane,** Air Research and Development Command; **Maj. David B. O'Hara,** Air Force Headquarters. Military host for the Squadron was **Col. Robert E. Fancher,** Commander, Greater Pittsburgh AFB, and an active member of the AFA Squadron.

In other events of the crowded program, several officers paid visits to high schools, grade schools, and colleges they themselves attended. **More than 6,000 students** in all heard the talks, in addition to those in unseen audiences for radio-television interviews of the AF figures.

Pittsburgh's "Meet Your Air Force" program rates a salute from all AFA members, and from us it earns the title, "Squadron of the Month." **Carl Long and Mrs. Ruth Young** were cochairmen of the program. Long is an AFA National Director.

"The Fur Rendezvous" is an annual event in **Anchorage, Alaska.** Citizens of the newest state call it **"The Mardi Gras of the North."**

This year the "Fur Queen" of the week-long wing ding was **Miss Patricia Baldwin** *(see cut),* daughter of **Air Force Capt. Richard H. Baldwin,** who is stationed at Elmendorf AFB. Pat, run-off winner of a talent search conducted by the Anchorage Squadron, will compete in July's Miss Alaska contest, winner of which goes to Miss America finals at Atlantic City, N. J.

Pat is a stewardess with **Northern Consolidated Airlines.** "The Fur Rendezvous," which features parades, pageants, and numerous civic events, attracted more than 2,000 persons this year.

Dan Plotnick, Commander of the **Anchorage Squadron,** writes that this is not the last to be heard from his bunch. "We may be from the Far North," he says, "but we're **one of the hottest Squadrons in AFA."**

Phoenix, Arizona's **Sky Harbor Squadron** does things in a big, effective way. On February 2 it held a well publicized **airborne Squadron meeting** high over Phoenix in the hold of a **giant C-133 transport.**

The high-level parley got an outstanding display of MATS transports well off the ground. The next day transports including the C-130, C-124, C-123, C-54, and C-47 along with the

(Continued on following page)

Newly crowned Alaska's "Fur Queen," Pat Baldwin, receives handshake from 10th AD Deputy Col. G. J. LaBreche. Anchorage Squadron sponsored her.

"Meet Your Air Force" principals in Pittsburgh program included, from left, State Wing Cmdr. Richardson, Brig. Gen. Lee, Cochairman Long, Col. Gabreski, Lt. Col. Shomo Squadron Cmdr. Shrader, Cochairman Young, Maj. Gen. Ligon, Brig. Gen. Hatch. Right, USAF color guard marches into Perry High School auditorium to open meeting there.

Giant C-133 transport draws attention of crowd at exhibition of MATS planes staged by Phoenix, Arizona's Sky Harbor Squadron at beginning of February.

C-133 were placed on show at Sky Harbor Airport. Some 40,000 persons viewed them.

Dual highlights of the show were provided by **Mrs. Paul Fannin,** wife of Arizona's governor, and an **experimental Douglas DC-8.** Mrs. Fannin, an honored guest along with Governor Fannin, christened a C-133 "State of Arizona" *(see cut).*

Honored guests along with the governor and Mrs. Fannin were **Harvey McKay,** AFA Far West Regional Vice President, and **Maj. Gen. F. E. Glantzberg,** MATS Vice Commander, Scott AFB, Ill.

Squadron Commander **True Childs** headed the program planning committee which included **James Shore, Ben Foote, James Verselline,** and others.

The **Dallas, Tex., Junior Chamber of Commerce** has chosen AFA's **Al Harting** as **"Aviation's Man of the Year."** Al, a member of the AFA Board of Directors, was national chairman of last year's **AFA Convention in Dallas.** Presentation of the award came at a luncheon presided over by **George Haddaway,** editor and publisher of *Flight* magazine.

Seven speakers each congratulated Harting on his promotion of aviation in Dallas. They were: **Harlan Ray,** President of Southwest Airmotive Co.; **Andy DeShong,** Assistant Manager of the Chamber of Commerce; **Maj. Gen.**

(Continued on page 167)

Mrs. Paul Fannin, wife of Arizona's governor, christens Douglas C-133.

HP roll drawing files—brand new way to cut unit, space, usage costs

FREE BOOK SHOWS HOW

you can slash filing costs with individual HP files, which interlock to form complete assemblies. Each HP file is self-indexed, dustproof, fire and water resistant—holds 1 to 30 drawings of any length. Sturdy HP assemblies are quickly installed, dismantled, moved—stack to ceiling, around obstacles, with other files. For complete HP details, write—

Visit Booth 150 World Congress of Flight. April 12-19 in Las Vegas

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interlock roll record files

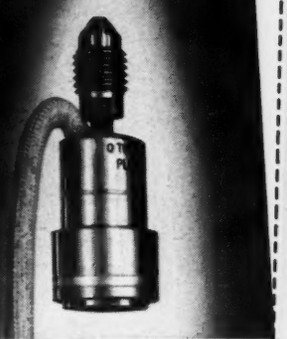
HAMILTON MANUFACTURING CO., TWO RIVERS, WISCONSIN

See pages 65-80 of this issue for details of

THE FIRST WORLD CONGRESS OF FLIGHT

Las Vegas, Nev.
April 12-19

STATIC or DYNAMIC pressure measurements to 600° F.



STATHAM P277 Pressure Transducer

(shown full size)

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For further information write for Data File AF-599-1.

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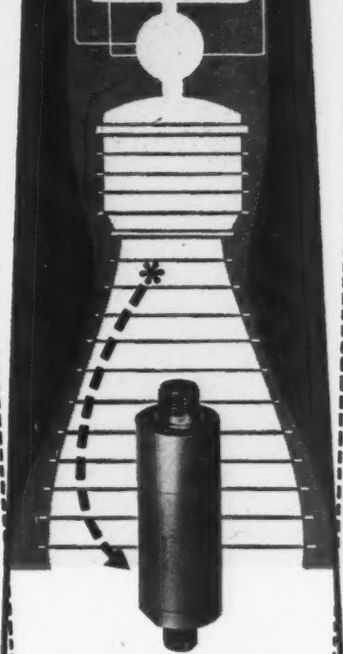

*STATHAM PA324 Pressure Transducer

Because of its outstanding performance in severe missile environments, the Statham Model PA324 Absolute Pressure Transducer has been chosen to play the key role in important new thrust control systems based on accurate measurement of thrust chamber pressure.

For further information write for Data File AF-600-1.

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STATHAM CA-9 Strain Gage Signal Amplifier

Through the use of modern design techniques, Statham has succeeded in drastically reducing the size and weight of strain gage signal amplifiers. Completely transistorized, the CA-9 is more reliable in adverse environments than larger and heavier amplifiers, and retains the precision needed in current aircraft and space vehicles.

Write for Data File AF-601-1.

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NEW VOUGHT CRUSADER FOR FLEET NEXT YEAR!

Navy orders fourth version of flexible, economical fighter

For the fourth time in three years, a new *Crusader* type is extending the power of the Fleet. Chance Vought's F8U-2N has been ordered by the Navy for delivery next year. It will deploy alongside the Navy's swiftest photoplanes and two first line day fighters – all *Crusaders.*

The F8U-2N is another step in *Crusader* growth. Speed of this newest version has been advanced to near Mach 2. It will carry the deadliest air-to-air missiles. It is instrumented and radar-equipped for supersonic combat in darkness or bad weather.

This will be a new capability for the Fleet. Yet it is being acquired at low risk and cost. The F8U-2N's basic design has been proved simple, serviceable and economical . . . compiling an enviable performance record in a year of foreign duty with two Fleets.

Again, the growth provisions of the Vought *Crusader* have provided immediate, low-cost upgrading of the Fleet's aircraft inventory.

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS

Right, Orange County, Calif., Squadron's recent "Navigator's Night" (see March issue). Second from left stands "world's worst" navigator, Douglas "Wrong-Way" Corrigan," second from right, polar submarine *Nautilus*' navigation system production engineer, Thomas Curtis. Corrigan once flew from New York to California by way of Ireland. Others in photo, from left, Squadron member John Ball, Squadron Commander George Floyd, Mrs. Thomas Curtis.

Below: Hardin W. Masters, left, Southwest Regional Vice President discusses National Defense Resources Conference with Brig. Gen. Charles Jung, center, and Brig. Gen. K. F. Zitzman, at opening of the Conference in Oklahoma City in February. Masters, a Reserve colonel, was an official of the Conference, which was held to help the Air Force and area industry find workable methods of cooperation.

Harry Crutcher, Jr., Chief of Staff, Texas ANG; **Howard Megredy**, Assistant City Aviation Director; **Tom McHale**, Chamber of Commerce; **Herbert Nichols**, Aviation Committee Chairman for the Chamber; and City Councilman **W. C. "Dub" Miller.**

Here's an important reminder. **AFA's National Nominating Committee** meets along with the **Board of Directors** in **Colorado Springs, Colo., June 4 and 5.** Details will be forthcoming. —GUS DUDA

MAKE YOUR RESERVATIONS NOW FOR AFA'S 1959 CONVENTION

AFA Convention Hotels

HOTELS	SINGLE	TWIN	1 B/R SUITE	2 B/R SUITE
DI LIDO	$12	$12	$28	
SHELBORNE	$10	$12	$15	$45
NAUTILUS	$8	$10	$22	
SHORE CLUB	$7-8	$7-8	$15	$22
RONEY PLAZA	$8-12	$10-16	$30	$45-60
ALGIERS	$9-11	$11-13	$26	
SEVILLE	$10-12	$14	$28	$42
SEA ISLE	$8-10	$12	$20	$36
SANS SOUCI	$12	$12	$24	
SAXONY	$9-10	$11-12	$22-24	$33-36
VERSAILLES	$10	$10	$20	
CADILLAC	$8	$10	$20	$30
CROWN	$8	$10	$20	$30
LUCERNE	$8	$10	$25	$35
SAN MARINO	$8	$10	$24	$30
EMPRESS	$8	$10	$20	
BARCELONA	$8-10	$8-10	$20	
SORRENTO	$8-12	$8-12	$20-24	
FONTAINEBLEAU	$16-22	$16-22	$40-45	$80
EDEN ROC	$14	$16	$40-56	$72
MONTMARTRE	$12-16	$12-16	$28-32	$42-48

Send your reservation to:
AFA HOUSING BUREAU
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MIAMI BEACH, FLORIDA

To the left are the official hotels for AFA's 1959 Convention in Miami Beach September 3-6, listed according to their distance from the Auditorium, with the di Lido nearest. Few hotels have single rooms—most are twin rooms (two beds). The rates refer to single or double occupancy. Hotels with lower rates may also be requested with the coupon below. There are many low-rate, good-quality hotels in the area of AFA's hotels, both on and off the beach. This will interest those making the Convention a family affair.

CLIP & MAIL YOUR RESERVATION TODAY!

1959 Air Force Association Convention & Panorama

Type or Print NAME _____ RANK, IF MILITARY _____

ADDRESS _____

CITY & STATE _____

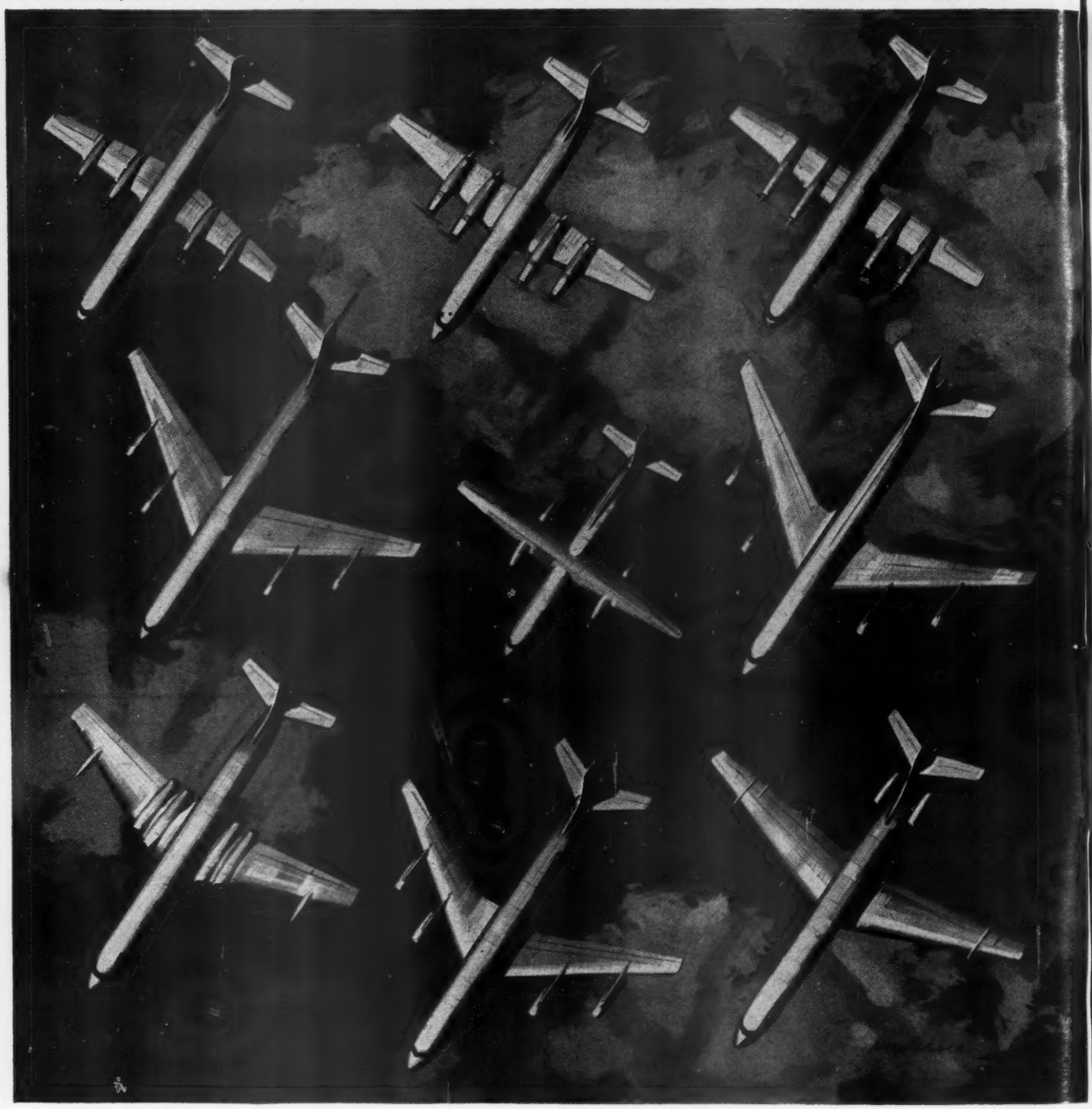
1st Choice Hotel _____ 2d Choice Hotel _____ 3d Choice Hotel _____

Type Room—Be specific on double or twin room. _____ Desired Rate _____

Others Sharing Room _____

Arrival Date and Hour _____ Departure Date _____

TOP FROM LEFT: LOCKHEED ELECTRA, BRISTOL BRITANNIA, VICKERS-ARMSTRONG VANGUARD. MIDDLE: BOEING 707, FOKKER/FAIRCHILD FRIENDSHIP, CONVAIR 880. BOTTOM: DE HAVILLAND COMET, DOUGLAS DC-8, SUD AVIATION CARAVELLE.



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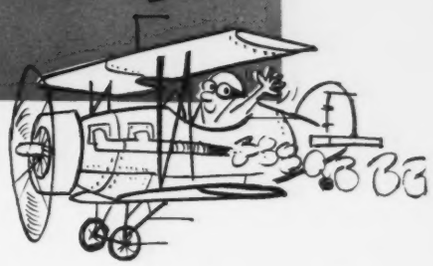

Gene Allison

SEE IF you can match these ten famed aviation pioneers' names with some of their daring deeds listed below.

Score less than four correct and you're out of gas so far as the quiz is concerned—but, look at the aviation history you've just learned.

Score four or five correct—you've got your engines started.

Score six or seven correct—you're airborne.

Score eight or more correct—do a loop, you're a real *ace* in air history. (*See page 187 for how well you did.*)

1. On December 9, 1909, at Hempstead Field, Long Island, N. Y., he successfully flew the first US monoplane.

( ) **Glenn Curtiss**
( ) **Ralph Johnstone**
( ) **Dr. Henry W. Walden**
( ) **Capt. Hawthorne Grey**

2. They or he flew a Fokker T-2 monoplane from New York to San Diego in twenty-six hours, fifty minutes in the first nonstop flight across the United States in May 1923.

( ) **Wiley Post and Harold Gatty**
( ) **Clarence Chamberlin**
( ) **James Knight**
( ) **Lts. John Macready and Oakley Kelly**

3. Known as the "Dresden China Aviatrix," in 1911 she became the first American woman to hold a pilot's license, and in 1912 she became the first woman to fly the English Channel.

( ) **Ruth Law**
( ) **Alys McKey Bryant**
( ) **Ellen Church**
( ) **Harriet Quimby**

4. On November 5, 1911, this cigar-chewing grandson of Commodore Perry landed his Wright EX pusher in Pasadena, Calif., forty-nine days after taking off from New York, completing the first flight across the United States.

( ) **Calbraith Rodgers**
( ) **Wiley Post**
( ) **Charles Willard**
( ) **Roscoe Turner**

5. In the Korean War he became the first pilot in history to score a victory in a jet-versus-jet dogfight. He flew a Lockheed F-80C at 600 mph, and the entire battle lasted one minute.

( ) **Scott Crossfield**
( ) **Lt. Russell Brown**
( ) **Lt. Col. Frank "Pete" Everest**
( ) **Capt. James Jabara**

6. Forty-five years ago, this pioneer was famous for his hair-raising aerobatics, performing every stunt or maneuver that was then or is now possible with an aircraft. One of his favorite spine-chillers was chasing Barney Oldfield around a half-mile track a few feet off the ground, patting race-car driver Oldfield gently on the head from time to time with a wing tip.

( ) **Charles K. Hamilton**
( ) **Eugene Ely**
( ) **Lincoln Beachey**
( ) **Frank Coffyn**

7. Starting to fly in 1912, she became America's greatest woman barnstormer and stunt pilot. She was the first woman to perform a loop and in 1919 she flew the first American airmail in the Orient from Manila.

( ) **Katherine Stinson**
( ) **Ruth Law**
( ) **Harriet Quimby**
( ) **Ruth Nichols**

8. He was the first pilot to fly from, or land on, the deck of a ship. The year was 1910, and the ship was the USS *Pennsylvania.*

( ) **Walter Brookins**
( ) **Eugene Ely**
( ) **Samuel P. Langley**
( ) **Octave Chanute**

9. On June 28, 1927, these two made the first successful flight from Oakland, Calif., across 2,400 miles of Pacific to Honolulu in a trimotored Fokker.

( ) **Wiley Post and Harold Gatty**
( ) **Lts. Albert Hegenberger and Lester J. Maitland**
( ) **Richard E. Byrd and Floyd Bennett**
( ) **Clyde Pangborn and Hugh Herndon**

10. Among many pioneering firsts, this designer-pilot built the first plane designed for the infant airmail service in 1919 and the first American metal monoplane in 1922. The latest spectacular plane to bear his name is the multijet Sea-Master.

( ) **Bill Boeing**
( ) **Igor Sikorsky**
( ) **Glenn Martin**
( ) **Alexander P. de Seversky**

'EVERYWHERE THEY GO'

Thanksgiving, 1958: turkey, traditional trimmings for airmen, sailor, Marine.

HERE'S wishing many happy returns to a civilian organization that has earned battle stars in every theater of US hot- and cold-war operations since 1941.

Its hot-war record runs from Pearl Harbor to Seoul—with familiar way stations along the route. At present it's manning a cold-war line stretching from the semitropical Riviera to snow-frozen Fairbanks, Alaska, from Istanbul to Tokyo to numerous towns throughout the United States.

Staggering statistics dramatize the global story of USO. Since 1941, 450,460 shows, many featuring the nation's top performers, have been staged here and overseas. Aggregate audiences at these shows totaled more than 237 million.

Last year America's two-and-a-half million servicemen paid forty-two million visits to USO clubs. Total attendance at USO dances, parties, and picnics was ten million.

In more individual human terms, to succeeding "generations" of US troops the USO is a smile and a soft drink, theater tickets or a Saturday night dance or a homemade Christmas dinner. The fact that at any given time half the Americans in uniform are in their teens and/or away from home for the first time adds a vital statistic to the picture.

USO, or United Service Organizations, was formed in 1941 by six private service groups—the Young Men's Christian Association, the National Catholic Community Service, the National Jewish Welfare Board, the Young Women's Christian Association, the Salvation Army, and the National Travelers Aid Association. It receives financial support from United Funds, Community Chest, and direct drives of its own in some parts of the country.

Perhaps even more important, right from the start, have been the contributions of time, great chunks of it, from local volunteers. Some 80,000 of them worked five million hours for the USO last year alone.

A poster currently being distributed to mark "USO Month," April, actually says all there is to say about a thoroughly worthy organization. On it, uniform caps of each of the four armed services are shown against the background of the globe. The legend reads, "USO, Wherever They Go."

—FREDERIC M. PHILIPS

D-Day plus, 1944: "Der Bingle" croons for weary troops in Normandy pasture.

Seeing the sights: USO tour party before familiar—and symbolic—structure.

spatial comprehension . . .*

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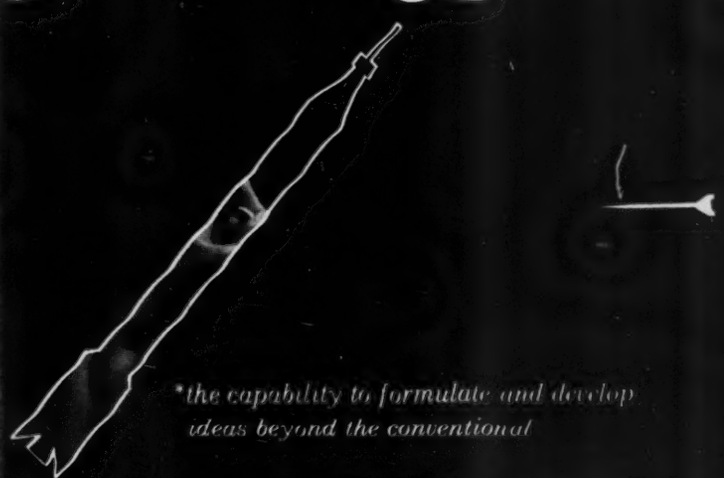
[illegible]NE R[illegible]VAIS[illegible].E SY TEM!



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* * * * * * * * * * *

* *

Good management, like a good quarterback, calls the right signals during the game and not on Monday morning. In the field of aviation and space, management must also call the right signals now for a game that won't be played for years to come.

At Grumman, the signals have already been called for nuclear propulsion systems, for the plasma harnessing of hydrogen fusion, for missiles, for hydrofoil seacraft, and for others still classified.

At Grumman, the signals that were called years ago have won design competitions: the A2F, a carrier-based attack fighter; the Mohawk, a twin turboprop higher-performance observation airplane for the Army; and the Eagle, an air-to-air and air-to-ground missile.

At Grumman, Monday morning is the beginning of the future.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION
Bethpage • Long Island • New York

In current production: F11F-1 Tiger, supersonic jet fighter; F9F-8T Jet Trainer; S2F, carrier-based anti-submarine aircraft; WF-2, carrier-based early-warning aircraft; SA-16 Albatross, rescue amphibian; Gulfstream, turboprop executive transport; AO-1AF Mohawk for the Army; Ag-Cat duster-sprayer.

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Now... Flight Pay *easy*, TWICE-A-

AFA, by special arrangement with Mutual of Omaha, now makes FLIGHT PAY PROTECTION available to you in *two* ways:

1 easy, twice-a-year payments of 1% of your annual flight pay, plus a $1 service charge, or

2 a single payment of 2% of your annual flight pay. (no service charge)

There's no change in the protection or the benefits you receive. AFA continues to operate the program on a low-cost non-profit basis solely for members and now offers this optional payment method to help ease the strain of your budget.

NOTE: There are some conditions and exclusions that affect your coverage under the Flight Pay Protection Plan. They are designed primarily to protect your investment in the Plan—restrictions that you'd normally expect.

For instance, you're not indemnified for illness or accidents which originate before the effective date of your coverage. Your coverage for accidents begins with the effective date of your policy. Your coverage for illness starts 30 days *after* the effective date of your policy. All policies become effective on the last day of the month in which the application is postmarked.

To be eligible for protection, you must have passed your last annual physical . . . be presently on flying status . . . and be a member of the Air Force Association.

Most claims are routine. Where a difference of opinion exists, the Air Force Association has the right to request a review of medical records and other claim evidence by appropriate medical authorities—normally the Office of the Surgeon General, USAF.

There are some other specific exclusions, covering groundings due to insanity, court-martial, attempted suicide, etc.; here they are in detail:

EXCLUSIONS

The insurance under the policy shall not cover loss to any Member resulting in whole or in part from or due to any of the following:

1. Criminal act of the Member or from injuries occasioned or occurring while in a state of insanity (temporary or otherwise).

2. "Fear of flying," as officially certified by responsible authority of the Member's Service and approved by the head of the Service in accordance with applicable regulations.

3. Caused by intentional self-injury, attempted suicide, criminal assault committed by the Member, or fighting, except in self-defense.

4. Directly or indirectly caused by war, whether declared or not, if act of an enemy in such war is the direct cause of loss insured hereunder, hostile action, civil war, invasion, or the resulting civil commotions or riots.

5. Failure to meet flying proficiency standards as established by the Member's Service unless caused by or aggravated by or attributed to disease or injuries.

6. Inability of a member to continue to meet physical standards for Hazardous Flight Duty because of a revision in those standards, rather than because of preceding injury or disease causing a change in the physical condition of such member.

7. Accidents caused while riding or driving in any kind of race.

8. Alcohol, drugs, venereal disease, arrest or confinement.

9. Willful violation of flying regulations resulting in suspension from flying as a punitive measure, or as adjudged by responsible authority

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Protection *on an* YEAR PAYMENT PLAN

Here's what Flight Pay Protection offers YOU...

- Tax-free indemnities of 80% of the flight pay you lose, if you're grounded by illness or accident.
- Retroactive payment on the first 3-months' flight pay you miss when grounded —90 days' indemnity in your first check.
- Payments for as long as 12 months, if you're grounded as a result of illness or ordinary accident.
- Payments for up to 24 months, if your grounding is caused by an aviation accident.
- Average amount of each of 215 claims paid in 1958 was $1830.
- Your payments for just one 90-day grounding will bring you 10 times as much as you pay for a whole year's protection.

So take a look at your budget now—see if you can afford *not* to buy this low-cost protection, especially now that you can put the plan into effect by sending us only 1% of your annual flight pay, plus a $1 service charge—pay the balance 6 months from now.

of the Member's Service.

10. Sentence to dismissal from the service by a general court-martial, submitted resignation for the good of the service, or suspension from flying for administrative reasons not due to injuries or disease.

11. Loss of life shall not be deemed as loss for purposes of this insurance.

12. Primary duty requiring parachute jumping.

13. Voluntary suspension from flying.

14. A disease or disability pre-existing the effective date of coverage, or a recurrence of such disease or disability, whether or not a waiver has been authorized by appropriate medical authority in accordance with regulations or directives of the service concerned.

15. Mental or nervous disorders.

Underwritten by Mutual Benefit Health and Accident Association (Mutual of Omaha).

T O D A Y ▶▶

AFA Flight Pay Protection Plan

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I enclose:

☐ $_____ semi-annual premium. (1% of annual flight pay, plus a $1 service charge.) Bill me every 6 months.

☐ $_____ for full payment of annual premium. (2% of annual flight pay.)

This insurance is available to AFA Members only.

☐ I am an AFA member. ☐ I enclose $6 for annual AFA membership.

_____

Rank (please print) Name

_____

Serial Number *Years Service for Pay Purposes*

_____

Mailing address

_____

Amount of Annual Flight Pay: $ _____

I understand the conditions and exclusions governing AFA's Flight Pay Protection Plan, and I certify that I am currently on flying status and entitled to receive incentive pay, and that to the best of my knowledge I am in good health, and no action is pending to remove me from flying status for failure to meet physical standards. I authorize AFA, or AFA representatives, to examine all medical records pertinent to any claim I may submit.

_____

Signature of Applicant *Date*

Application must be accompanied by check or money order. Send remittance to FLIGHT PAY, Air Force Association, Mills Building, Washington 6, D.C.

4 59

Serving a significant professional need

BOOK CLUB ENTERS SECOND YEAR

Peter J. Schenk
PRESIDENT, AIR FORCE ASSOCIATION

ALTHOUGH the Airpower Book Club, sponsored by the Air Force Association, has been in operation only a little more than a year, the idea of a professional reading club, appealing to readers interested in military airpower and related fields, celebrates its fifth birthday this month.

It was in April 1954 that Gen. Curtis E. LeMay, now Vice Chief of Staff of the Air Force, then Commander in Chief of Strategic Air Command, formally and officially proposed the establishment of such a club through the Air University Book Department. Rather exhaustive preliminary investigation indicated (1) that such a book club would be a valuable adjunct to the Air Force mission; (2) that it would be inadvisable for the Air Force to take on such a task on an official basis; (3) that the Air Force Association should be invited to take on the project on a nonprofit basis, rather than turning it over to a commercial firm.

This, briefly, is how AFA got into the book club business. Before setting up shop, we surveyed most of the major book clubs. Considering the fact that AFA, as a nonprofit organization, was not prepared to risk any sizable amount of capital, it quickly became apparent that the conventional book club pattern of a monthly selection, which the member could either accept or reject as long as he bought a stated minimum number of books annually, would not work. Large sums of money would be tied up in book inventories and the clerical overhead would be excessive. An added factor was the difficulty of finding twelve books a year, on a month-by-month basis, that would be worthy of selection for a club of this type.

We decided to try a different approach, to form a book club that would be truly a "club," with a flat sum for annual dues and with four selections annually.

After a little more than a year of operation, the current membership of the Airpower Book Club stands at approximately four thousand. They pay annual dues of $15 and thus far have realized tremendous savings on their book-buying investment. Those who enrolled as charter members received for their $15, during the first year, five books including a free bonus book. The titles, with retail prices, indicate what a bargain membership can be:

A History of the United States Air Force (Bonus Book)	$6.75
Mitchell—A Pioneer of Airpower	6.00
The United States Air Force Report on the Ballistic Missile	4.00
Soviet Strategy in the Nuclear Age	4.50
Memoirs of Field Marshal Montgomery ..	6.00

Thus, a member who joined the Club at its inception received for his first $15 a total of $27.25 worth of books, almost a fifty percent saving.

The current premium, offered to renewal members and new members who forward cash with their order (this saves clerical costs), is *Space Weapons,* a book compiled and edited by the Editors of AIR FORCE Magazine. It sells in the bookstores at $5. In addition, they will receive, immediately, the first selection of the current annual cycle —*Impact of Air Power,* edited by Dr. Eugene Emme, formerly on the staff of the Air University. *Impact* retails for the whopping sum of $12.50 and it's a whopping book—914 pages.

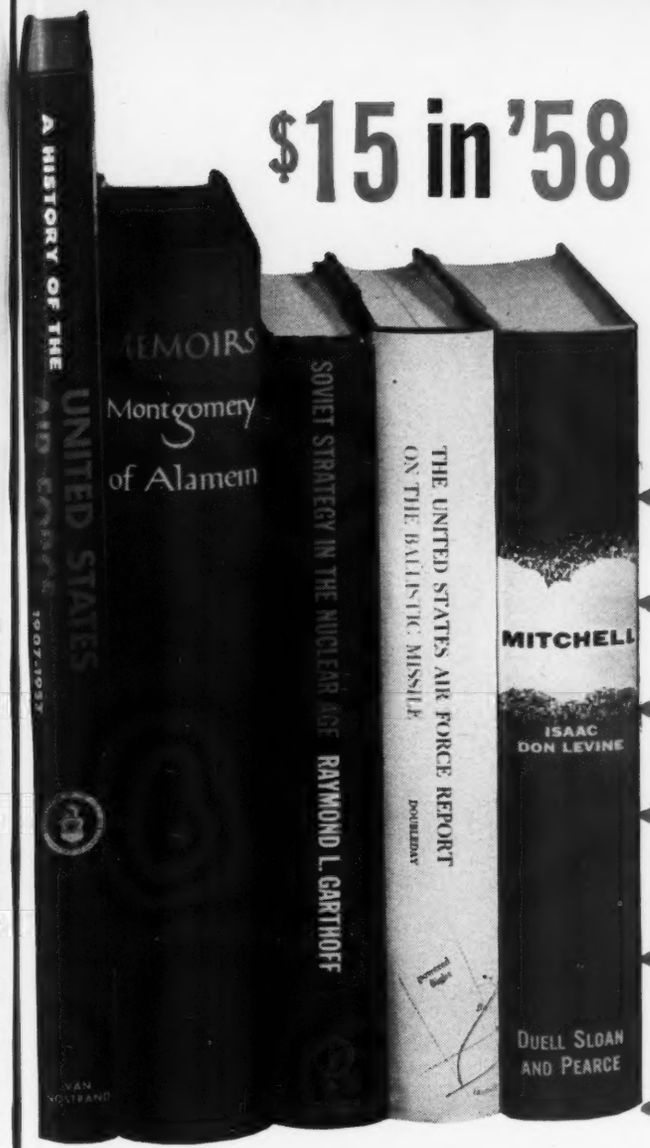
So if you join or renew now, while *Impact* is the current selection (and send in the $15 with your order) you get $17.50 worth of books right off the bat, with three more books coming to you before your dues are payable again. For an investment of barely more than the cost of a four-cent stamp per day you're bound to wind up with between $25 and $30 worth of books. If you'd rather have the Club bill you later, we trust you. But the extra bookkeeping cost means we can't afford to send you the bonus book. (*See the opposite page for details.*)

You may wonder what factors enter into the selection of titles for the Airpower Book Club. In the first place, although the Club has "airpower" in its title, we feel the scope should be broad enough to include pertinent related professional reading. Thus, during the first year, selections included a history of the Air Force, a biography of an airpower pioneer, a definitive study of the USAF's ballistic missile program, and the memoirs of a great military leader.

Some may question what the memoirs of a ground soldier are doing among the selections of an airpower book club. The answer is (1) that it was the most suitable title available for distribution during the last quarter of 1958; (2) that Montgomery has a deep and abiding appreciation of the place of airpower in today's military world; (3) that, agree with him or not, he was a great leader and his thoughts on leadership are as applicable to Air Force problems as to Army problems.

We feel that the Airpower Book Club is sound in principle and has been of great value. During the first year of operation we ran into a few bugs and made some mistakes. We think we've got it licked now. Doubling our membership during the current year will put us out of the nonprofitable status into the nonprofit (there's a difference) break-even position. Beyond that we hope to pour profits back into more books, lower prices, added service.—END

$15 in '58 brought Airpower Book Club members...



Mitchell: Pioneer of Airpower
by Isaac Don Levine **$6.00**

The United States Air Force Report on the Ballistic Missile
edited by Lt. Col. Kenneth F. Gantz **4.00**

Soviet Strategy in the Nuclear Age
by Raymond L. Garthoff **4.50**

The Memoirs of Field Marshal Montgomery
. . . . . **6.00**

History of the USAF—1907 - 1957
. . . . . **6.75**

Total Retail Value $27.25

$15 in '59 brings you *to start...*

The Impact of Air Power edited by Eugene M. Emme **$12.50**

Space Weapons—A Handbook of Military Astronautics
Compiled and Edited by the Editors of AIR FORCE Magazine **$5.00**

Total Retail Value . . . . . $17.50 . . . . . to start your membership

plus...

3 more selections at no additional charge.

Every Book Club selection is a book you need.

In choosing the five best books each year, your need becomes the Book Club requirement.

Members got the best books last year at a 45% saving on normal retail price.

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AIRPOWER BOOK CLUB
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☐ I enclose $15. Send me THE IMPACT OF AIRPOWER, the next three Book Club selections and SPACE WEAPONS as a bonus for cash payment.

☐ Bill me for $15. Send me THE IMPACT OF AIRPOWER and the next three Book Club selections.

Either choice entitles me to all membership privileges—including a 10% discount on other books I buy.

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(PLEASE PRINT)

ADDRESS _____

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AF 49

ARCH WHITEHOUSE

tells the exciting story of the men, the planes and the tactics that made 1914-1918

The Years of the Sky Kings

WRITTEN by a World War I flier, this is the first book which at once contains the facts about the planes, catches the spirit of the men who flew them, and puts the early days of aerial warfare in proper perspective. It details the evolution of air-combat techniques, answers the historical questions about the functions and usefulness of the airplane as a weapon, and appraises the performances of dozens of aircraft that were adapted to and developed for this new concept in military operations. *Special features:* 16 pages of photographs; year-by-year and country-by-country lists of operating warplanes, including the Spad, the Camel, the Fokker; rolls and records of Allied and enemy aces, including von Richtofen, Fonck, Rickenbacker, Lufbery, etc.

$4.95 at all booksellers or direct from DOUBLEDAY & COMPANY, Inc. **Dept. 9-AF-4 Garden City, N.Y.**

airman's bookshelf

Dateline Spain

***Fandango Rock*, by John Masters (Harper, $4.50)**

Reviewed by Frank W. Anderson, Jr., Capt., USAFR

To those familiar with John Masters' writing, *Fandango Rock* may come as a surprise. Here the setting is Spain, the time the present, the theme the clash of Spanish and American civilization in the vicinity of an American air base in Spain.

One can see the broad similarity between the present American-Spanish juxtaposition and the British-Indian one that formed the background for most of Masters' previous fiction. As the British world interests and industrial civilization stood in bold relief against the exotic, insular tapestry of great wealth and incredible squalor in nineteenth-century India, so does the American global defense structure, with its worldwide air bases, B-52s, and rock-and-roll frivolity contrast with a provincial and medieval culture in twentieth-century Spain.

The sultry somnolence of the fictitious Spanish town of Medina Lejo has not long been shattered by the roar of USAF B-52s (fictionally based in Spain rather than the B-47s that are actually there) when the atmosphere between town and base turns sullen, then tense, and finally explosive. To the normal if regrettable friction engendered by auto accidents, fist fights, misunderstandings, and trespasses on local custom, there is added the sinister plotting of a group of fanatic Spanish nationalists who hope to capitalize on these difficulties and others to create such a chain of incidents that Spain's ruler, General Franco, will demand the withdrawal of American forces.

As one would expect from Masters, the plot is well handled and moves rapidly. The Spanish setting is theatrical and convincing, more convincing, unfortunately, than the American characters and the activities of the B-52 wing. The Americans are either strong or weak, with none of the lights and shadows of the Spanish, who are allowed the human frailty of having both strengths and weaknesses. Technical material on flying B-52 missions, maintaining the aircraft, running the wing, is larded into the book in undigested lumps. The air base stands apart from the community; well scrubbed and disinfected, it never comes alive in the sense that the Spanish town does.

Mr. Masters paints well the complex local problem of community relations. Some might say he overdramatizes, what with a missing relic from the local church, a rape, the cloak-and-dagger skulduggery of the Spanish nationalists. But as many a man who has commanded such a base overseas or headed a community-relations program in such localities can testify, there is almost no way you can overdramatize or overcomplicate what can and sometimes does happen.

It is a good novel, written against a rich background. It is just good enough to leave one with the wistful feeling that it might have been just that much better.

About the reviewer: *Managing editor of the* Air University Quarterly Review, *Dr. Anderson received his Ph.D. in English literature from the University of North Carolina where he also was a member of the faculty. He served in World War II as a photo interpreter. He recently edited an anthology of distinguished aviation literature,* Great Flying Stories.

War Birds

***The Years of the Sky Kings*, by Arch Whitehouse (Doubleday, $4.95)**

Reviewed by Col. Samuel Taylor Moore, USAF (Ret.)

For two generations Arch Whitehouse has played literary matchmaker in the enduring love affair between American and British military airmen. Here he writes—in the idiom of the Royal Flying Corps in which he served—an expert, readable, popular history of World War I in the air. The volume traces the technological and tactical evolution of the aerial weapon as it tells the stories of the leaders.

Whitehouse graphically presents aircraft design advances from a heterogeneous collection of box kites to the forerunners of today's specialized types —fighters, bombers, recons, etc. He accounts for the development of air armament from cavalry hand-carbines, metal darts, and even bricks, to synchronized machine guns and bombs of all sizes. And when he talks about powerplants one can almost smell the hot castor oil of the old rotary engines.

(Continued on page 181)

FORCE

ORDNANCE!

Test of a warhead developed by Rheem that utilizes a new principle in the state of the art of warhead design. Rheem development is fully supported by test sites, chemical laboratory, ballistics tunnel and a separate Explosives Loading Facility.

For the past two decades and through two major conflicts, Rheem Ordnance has been *a force to reckon with.* As a major ordnance contractor for our Armed Forces, Rheem produced millions of shells and made significant contributions to ordnance technology in the design, development, and production of fuzes, rockets, practice bombs, land and underwater mines, and other conventional armament.

Today, all branches of the Armed Forces continue to look to Rheem for leadership in Explosive Ordnance, Missile Warheads and Fuzes, and Basic Research. A partial list of current projects underway at Rheem includes:

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- **NON-NUCLEAR WARHEADS**
- **WARHEAD ADAPTION KITS**
- **FUZES AND SAFETY AND ARMING DEVICES**
- **EXPLOSIVELY ACTUATED VALVES, SWITCHES, SEPARATION DEVICES**
- **EXPLOSIVE FORMING OF METALS**
- **EXPLOSIVE RESEARCH AND HYPERVELOCITY IMPACT**
- **RELIABILITY AND LETHALITY STUDIES**

Rheem Ordnance makes many products that it hopes will never be used. But the ultimate in reliability is carefully engineered into every Rheem product, so that, should an aggressor strike, America's defenses will not be found lacking.

For more complete information on Rheem Ordnance capability, write to Dept. AF-707-1

Newly developed fuze for Nike Hercules warhead—designed, tested and produced by Rheem

BDU-4/B: one of a family of full-scale practice bombs developed for the Air Force by Rheem

Advanced warhead for Nike Hercules: developed, tested and produced by Rheem

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ORDNANCE • PROPULSION & MISSILE SYSTEMS • PRESSURE VESSELS • DRONES • ELECTRONICS • RESEARCH

CASE HISTORIES

Frequency Time Standard instruments, selected by Smithsonian Institute to clock satellites, are equipped with New Departure ultra-precise ball bearings.

Photos: Courtesy Ernst Norman Laboratories and Bodine Electric Co.

Ultra Precise Ball Bearings Help "Clock" A Satellite!

CUSTOMER PROBLEM:

Require ultra-precise bearing design for Bodine electric motor used in satellite-tracking micro-clock. Bearings must provide uniformly low starting torque, precise location of rotor shaft and minimum maintenance, to help mechanism achieve time determinations to 0.001 second.

SOLUTION:

N/D Sales Engineers studied special bearing requirements, and recommended New Departure ultra-precise ball bearings. These ball bearings measured up to every requirement for micro-clock motors . . . thanks to New Departure's advanced equipment for research, development and production. N/D equipped micro-clocks, selected by the Smithsonian Institute, are operating in a dozen locations around the world right now, keeping track of vital satellite movements . . . to accuracies of one millisecond and better!

If you're manufacturing or designing electric motors for any high precision applications, including instruments, why not call on New Departure? N/D engineering and research facilities are turning out the latest in high precision instrument ball bearings and advanced ball bearing designs. For more information write Department AF-4.

NEW DEPARTURE

DIVISION OF GENERAL MOTORS, BRISTOL, CONN.

NOTHING ROLLS LIKE A BALL

Constantly improving airframes, engines, and air armament made possible rapid advances in aerobatic maneuver and the transition from the "lone-wolf hunter" to the team combat concept, perfected through formation flying. Only in the last months of the war, Whitehouse recalls, were ground-support tactics standardized and strategic bombing ideas demonstrated by operations of the Air Force.

Photographs portray the aces and the machines they flew, including forgotten triplanes, an early rocket plane, and the first all-metal combat type.

About the reviewer: *Samuel Taylor Moore, Col., USAF (Ret.), has been writing about military aviation ever since 1916 when he was an accredited correspondent with the Mexican Punitive Expedition. During World War I he was with the Air Service in France. He retired from the USAF following Korea. The author of articles, fiction, and books on military air matters, he is an occasional contributor to* AIR FORCE/SPACE DIGEST.

US Civil-Military Relations

***Arms and the State*, by Walter Millis, with Harvey C. Mansfield and Harold Stein (Twentieth Century Fund, $4)**

Reviewed by Col. F. E. Timlin, USAF

Walter Millis has been examining military affairs for a long time. In *Arms and the State,* his newest volume, he surveys US civil-military relations from 1930 onward and studies the confluence of civil and military factors in the development and application of national policy.

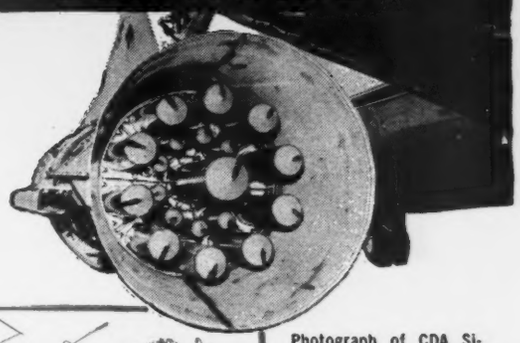
The book is divided into two parts. Part I analyzes the interrelationship of civil and military groups (or lack of it) from 1931 to 1945. The approach is pragmatic and tends to be onerous. Prior to World War II Millis sees the military officer operating within, but largely apart from, the larger official structure. Military problems were solved in isolation from the broader national framework. Conferences that today would include participants from all the services, State Department, Bureau of the Budget, the scientific community, etc., were unthinkable then. As the war progressed, the complexity and inner-workings of military-state matters forced an increased degree of coordination. President Roosevelt, because of his friendly attitude toward the

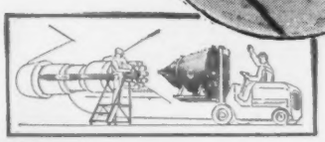
(Continued on following page)

IAC meets the problems of JET NOISE!

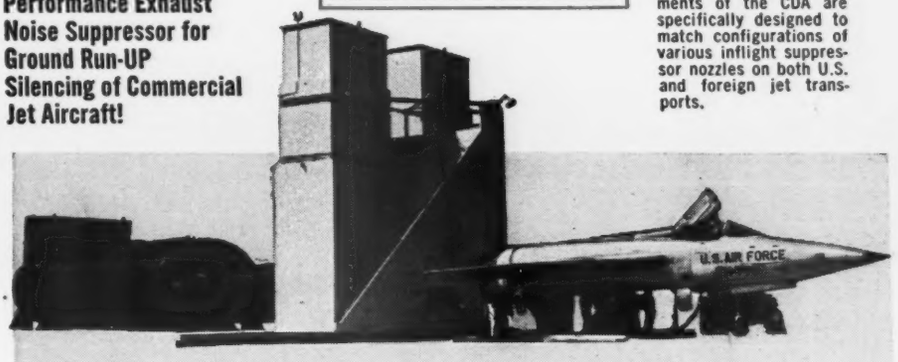
for commercial jet aircraft...

Presenting the new CDA Multi-JET Commercial — Directly Attached Lightweight — High Performance Exhaust Noise Suppressor for Ground Run-UP Silencing of Commercial Jet Aircraft!





Photograph of CDA Silencer attached to jet engine of a Boeing "707" airliner shows how the acoustical elements of the CDA are specifically designed to match configurations of various inflight suppressor nozzles on both U.S. and foreign jet transports.

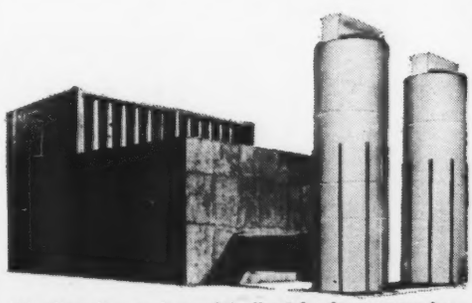


for military aircraft

At Republic Aviation, IAC's new "two story" ground muffler features a tail enclosure for complete and effective silencing of J-75 jet engines in F-105 aircraft. This new ground-run-up muffler which has been designed for full-power ground tests is demountable for relocation if desired.

for military and commercial aircraft

The trailer mounted MDU Ground Run-Up Silencer, adaptable to any aircraft or engine field operation offers a highly maneuverable unit for both military afterburner and commercial equipment. The MDU suppressor is adjustable to all engine positions.



for jet and rocket engines

IAC's proven DURA-STACK All-Steel Silencing Systems are effectively controlling noise of jet and rocket engines in test cells at both military and commercial installations around the world!

IAC offers the most complete line of noise suppression equipment engineered for jet and missile engines of today and tomorrow! Complete literature will be sent upon request.

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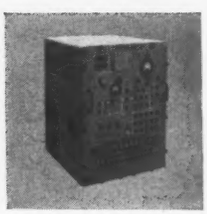

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armed forces, did much to foster this.

In Part II, 1945-57, Millis summarizes the events that led to the National Security Act of 1947, and probes the effects of atomics on the US position in postwar negotiations. He shows how the ascending military influence brought an even closer mingling of civil and military leaders. The Armed Services Unification Act of 1947, he believes, failed to meet its expectations largely because of President Truman's disinclination to make full use of the National Security Council.

Recent history from V-E Day to 1956 is examined and recounted—including budget matters, the B-36 hearings, NATO, nuclear strategy, and the Korean conflict, among others. The events of 1956-57 are touched on lightly.

Millis cites Korea as a shining example of an unsatisfactory civil-military relationship in the postwar period. He devotes more than seventy-five pages to the events which led to Gen. Douglas MacArthur's "deliverance" by Mr. Truman, an act Millis highly endorses.

Millis concludes that two world wars, the advent of expensive and devastating weapons, the complex problems of the cold war, the growing stature of military leadership all have helped to suppress traditional fear of military predominance in government.

Arms and the State is a well documented, closely written study. It deserves attention by the military and civil servant alike.

About the reviewer: *Col. F. E. Timlin is Asst. Chief, Air Policy Division, DCS/Plans, Hq. USAF, and a graduate of the Air War College, the AC&SC, and the RAF War College. He has served as Asst. DCS/Operations, TAC, and on the faculty of the Air University where he helped found the Squadron Officers Course. On December 7, 1941, he was with the 27th Bomb Group in the Philippines. After evacuation to Australia, he flew combat with the Ninth Air Force in the ETO.*

Men of Science

Rambling, interesting, but not easy reading—such is the autobiography of Sir Robert Watson-Watt, the British inventor of radar. *The Pulse of Radar* (Dial Press, $5) traces his early life and experiments with radio waves and his leadership of a research group studying radio-wave propagation during the 1920s and the early '30s. Out of this came radar.

As early as February 1935 Sir Robert presented a memorandum to the British Air Ministry proposing that an integrated detection-identification system be set up in conjunction with the RAF. By the time war came this had been done, and RAF Fighter Command utilized radar (such as it was then) to great advantage.

Much of the book is devoted to World War II radar-detection of enemy planes and surface warships, collection of intelligence, and aid to offensive Allied air action. Pearl Harbor receives considerable treatment. Watson-Watt claims adequate radar warning of the Japanese attack was received to give the islands an hour's notice.

The book wholly neglects American radar research and development which was carried on concurrently with the British. It reveals many previously unpublished incidents and events of the war to show how much final victory owed to radar. These form the most interesting sections of the work.

* * *

In the course of human affairs there may someday be another drama greater than that surrounding the development of atomic and nuclear bombs—a story which is told in *Brighter Than a Thousand Suns*, by Robert Jungk (Harcourt, Brace, $5). It all begins farther back than many of us can well remember.

As early as 1919 "transmutation of matter" was known by a small group to be a distinct possibility. The artificial disintegration of the atom was whispered about in scientific circles as a matter of time and of greater consequence to mankind than any discovery of the past. Jungk traces this nuclear scientific experimentation through the years in style and phrase that both intrigues and spellbinds, in terms of the men behind the atom, not the actual resources required to build the bomb. The lesser and well known scientists emerge as human beings with normal emotions as well as calculating, competent theoreticians and experimenters. Almost all recognized the evil and dangerous aspects of splitting the atom, says Jungk, and many joined petitionary groups to prohibit military and state leaders from adopting it to a weapon of war.

While much of the early research was done by European scientists, it reached its climax in America. The story of the researchers and their work at Los Alamos adds a fascinating

(Continued on page 185)

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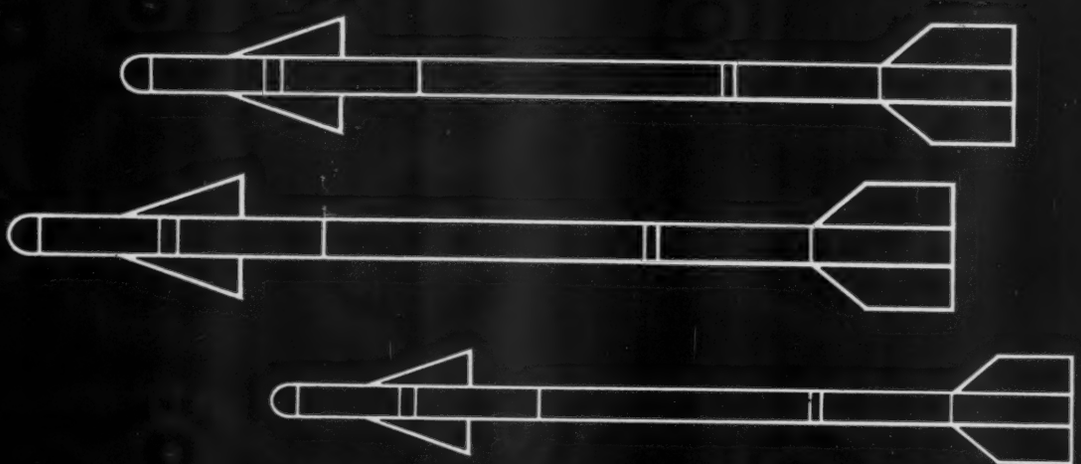

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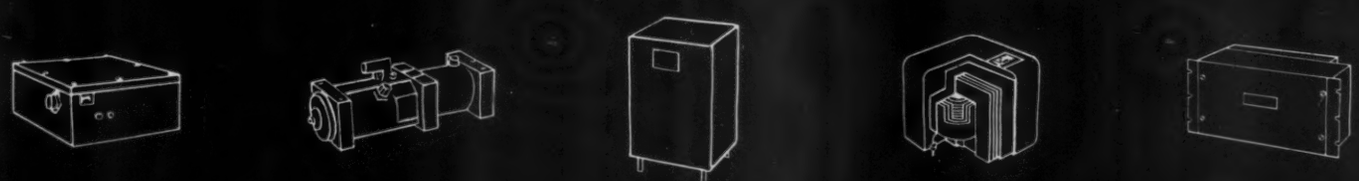

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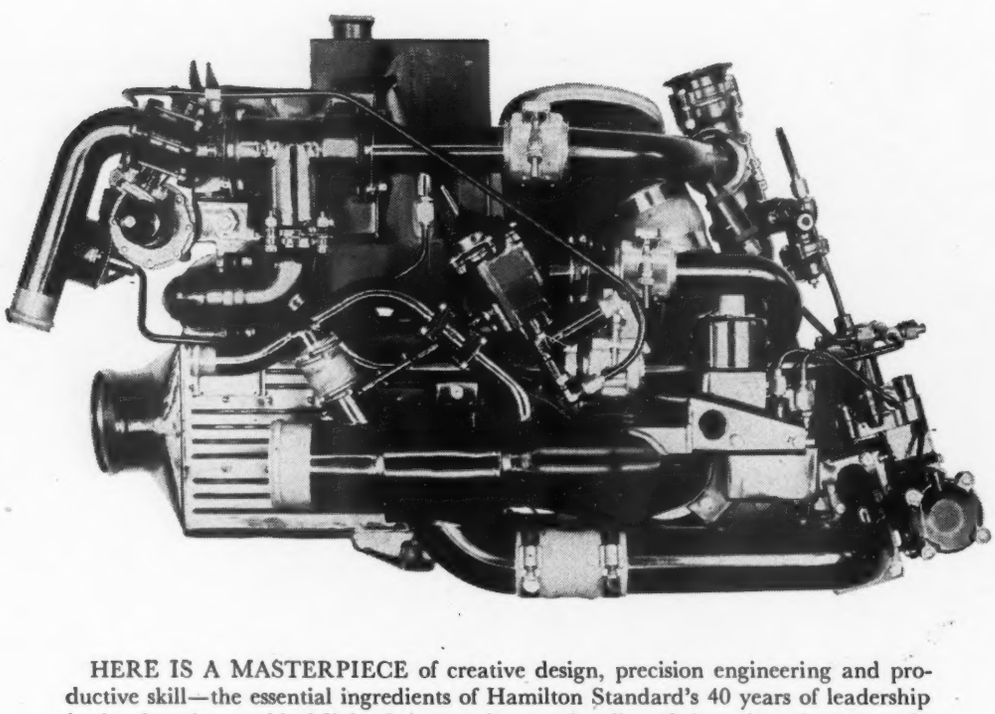

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chapter to the epic. About half the book is devoted to the postwar decade's refinement of nuclear bombs of all sizes, the affairs and fate of the key scientists who played a role in developing nuclear energy, and the dilemma of a world in which the two great powers face each other armed with such deadly weapons.

• • •

More than 2,500 years of scientific achievement are reviewed in *Moments of Discovery*, edited by George Schwartz and Philip W. Bishop (Basic Books, two vols., $15). The first volume deals with the origins of science, the evolution of the scientific approach, and the scientific revolution itself, featuring men like Galileo, Copernicus, Halley, Boyle, Newton, and Priestley. The second relates to modern science and deals mainly with the form and function of living matter, medicine, chemistry, physics, and other areas. Featured are the original writings of eighty-three of the world's foremost men of science, from Archimedes to the atomic physicist of today. The editors provide introductions to this material which give the work perspective, filling in a rich background, interrelating the subjects, and forming an accurate, proud history of science.

• • •

A valuable contribution to technical libraries is *Electronic Avigation Engineering* (International Telephone and Telegraph Corp., $9.50), which renders detailed analysis of electronic and radio aids to navigation. Author Peter C. Sandretto, an AF Reserve brigadier general, is vice president and technical director of IT&T Laboratories. This is his second book. The first was *Principles of Aeronautical Radio Engineering*.

Aerospace Books

If you're a pilot—student, amateur, or professional—you'll be interested in the newest "how-to-fly-it"—*As the Pro Flies*, by John R. Hoyt (McGraw-Hill, $4.95). This popularly written text is a gold mine of instructional material on the basic skills for flying lightplanes and the advance techniques which must be mastered by all pilots, whether lightplane or multiengine, conventional or jet. As the title implies, the book is based on the personal experiences of Hoyt, former Navy flyer, CAA administrator, and long-time flying instructor; some of the material has previously appeared in *Flying* magazine. On the whole,

(Continued on following page)

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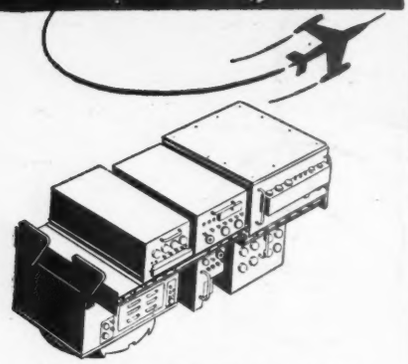

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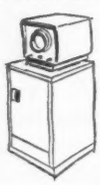

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AIRMAN'S BOOKSHELF — CONTINUED

the book is new, covering every skill and phase of "pilotry" from simple stalls and the use of flaps, to GCA, omnirange, navigation, weather and instrument flight, etc. The informal style of the author and his ability to combine the psychological-physiological-mechanical aspects of flight make an interesting volume on a subject that could be textbook dull.

• • •

The reissue of three out-of-print Nevil Shute air novels marks the popularity good air fiction is enjoying. *An Old Captivity* (Morrow, $3) relates a thrilling aerial expedition to Greenland by an archeologist and his daughter. *Landfall* (Morrow, $3) is a warm, tender romantic novel set against the background of the RAF at war. The classic Shute war novel *Pastoral* (Morrow, $3) sets a vibrant pace, mixing the bleak realities of bitter aerial combat with a charming love story of a pilot and a WAAF during World War II.

• • •

For the science-fiction fans, *The Enemy Stars,* by Poul Anderson (Lippincott, $2.95), presents an epic adventure on the spaceship *Southern Cross* on a voyage to the farthest reaches of outer space. Ten generations of successive crews are sent out to man the ship which eventually burns out to leave those aboard faced with making the necessary repairs in the appalling loneliness of space. The interplay of human emotions within this setting provides the framework for a novel which might well someday be more fact than fiction.

• • •

Newest handbook on missiles, rockets, and space comprises an organized compilation of information and photos released by the various military services and NASA. *Destination: Space,* by John L. Russell, Jr. (Popular Mechanics Press, 75¢), is a paperback produced in the format and size of *Popular Mechanics* magazine. Chapters cover a very general history of rocketry, the missiles of all services classed according to type and mission, the moon probes, the family of ICBMs, missile research in the US, space medicine research, the nature of space, foreign missiles, Russian progress, and the latest developments in US missilry. Much like the magazine, it is well illustrated with captions giving supporting data to the text.

Technical Volumes

Jet Propulsion Engines, by O. E. Lancaster (Princeton Univ. Press, $20). Volume 12 of the High Speed Aerodynamics and Jet Propulsion Series.

Aircraft Engines of the World, 1958/1959, by Paul H. Wilkinson (Paul H. Wilkinson, $15).

Combustion and Propulsion, Third AGARD Colloquium: Noise-Shock, Tube-Magnetic Effects, Instability and Mixing, edited by J. Fabri, A. H. Lefebvre, O. Lutz, and M. W. Thring (Pergamon Press, $20).

Introduction to Geophysics, by Benjamin F. Howell, Jr., (McGraw-Hill, $9).

Related Subjects

The University of Michigan is presenting a distinguished new series, *"History of the Modern World,"* edited by Allan Nevins and Howard M. Ehrmann.

Fifteen or more volumes are planned in this comprehensive, scholarly, and authoritative documentary of the modern world. The series is well under way with these four recent publications:

Latin America, by J. Fred Rippy ($10).

The Far East, by Nathaniel Peffer ($7.50).

The Near East, by William Yale ($7.50).

Russia and the Soviet Union, by Warren B. Walsh ($10).

The volumes afford a guide to peoples and nations, to their social, economic, political, military, cultural, and religious backgrounds, and the evolution of states and areas into current political entities.

Also Recommended

The Crossing of the Antarctic, by Sir Vivian Fuchs and Sir Edmund Hillary (Little, Brown, $7.50).

Nautilus 90 North, by Cmdr. William R. Anderson, USN, with Clay Blair, Jr. (World, $3.95).

The Communist World and Ours, by Walter Lippmann (Little, Brown, $2).

What's Wrong with US Foreign Policy, by C. L. Sulzberger (Harcourt, Brace, $4.50).

The Forsaken Army, by Heinrich Gerlach (Harper, $3.95).

Main Street USSR, by Irving R. Levine (Doubleday, $4.50).

The Second World War (abridged), by Winston S. Churchill (Houghton Mifflin, $7.50).

Education and Freedom, by Vice Adm. Hyman G. Rickover (Dutton, $3.50).

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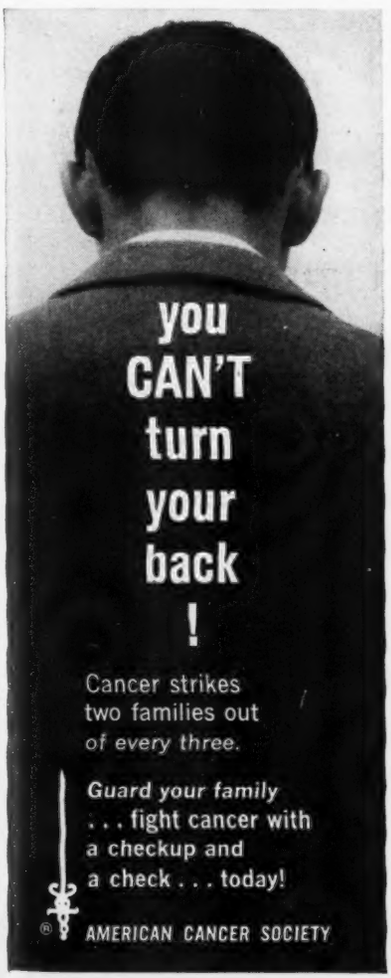
7. Ruth Law
8. Eugene Ely
9. Lts. Albert Hegenberger and Lester J. Maitland
10. Glenn Martin



BOOKSHELF ——— CONTINUED

New Paperbacks

The Prisoner of Combine D, by Len Giovannitti (Bantam, 50¢) — Novel about life in an AF POW camp in Germany in World War II. Fiction based on fact.

The Fastest Man Alive, by Lt. Col. Frank K. Everest, USAF, as told to John Guenther (Pyramid, 35¢)—Biography of "Pete" Everest, top AF rocketplane test pilot and his story of the X-1 and X-2 programs.

70,000 to 1, by Quentin Reynolds (Pyramid, 35¢)—True story of an Air Force flyer shot down on a Pacific island in World War II and his escape through the jungle.

The Sledge Patrol, by David Howarth (Ballantine, 35¢)—Exciting story of seven men on patrol in the wastes of Greenland in World War II and their efforts to forestall a German invasion party.

The Fatal Decisions, edited by Seymour Freidin and William Richardson (Berkley, 50¢)—Famous decisions of German generals which led to defeat in World War II.

Nuclear Weapons and Foreign Policy, by Henry A. Kissinger (Anchor Books, 95¢)—The well known recent study of modern military forces, tactics, and strategy in the nuclear age.

The Death of Hitler's Germany, by Georges Blond (Pyramid Books, 35¢) —The dramatic story of the Nazi's last days.

Hitler's Secret Service, by Walter Schellenberg (Pyramid Books, 35¢)— The true, incredible story of the dread SS, by its chief.

V-2, by Walter Dornberger (Ballantine, 50¢)—The story of Hitler's "secret" weapon by the former German missile expert in charge of the program. An early classic in missile literature.

Falling Through Space, by Richard Hillary (Dell, 35¢)—The personal story of an RAF fighter pilot who describes the Battle of Britain and the air war against the Luftwaffe.

Historic Documents of World War I, edited by Louis L. Snyder (Anvil, $1.25), and *Historic Documents of World War II*, edited by Walter Consuelo Langsam (Anvil, $1.25)—Significant official and unofficial papers that reveal rare background glimpses into some of the great actions of both wars.

New Tales of Space and Time, by Raymond J. Healy (Pocketbooks, 25¢) —Science fiction.

Station in Space, by J. Gunn (Bantam, 35¢).

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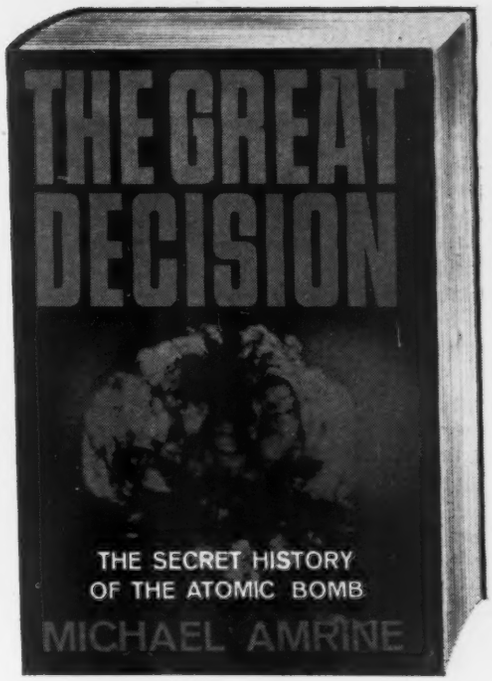
A chapter from an important new book, *The Great Decision*, which tells the story of the policy meetings and decisions that attended the dropping of the first atomic bomb on Japan and arranging the surrender

'A RAIN OF RUIN'



Michael Amrine

HIROSHIMA was the beginning of the age we now live in.

Looking back, we tend to remember only the main outlines. The bomb dropped. Japan surrendered. Americans and their Allies celebrated "V-J Day."

But it was not that simple. On the day after the bomb, August 7, 1945, it did *not* seem a foregone conclusion that Japan would surrender because of the new weapon, and Japan did not immediately sue for peace. Why not?

The answer is involved, and exactly how this war ended is still the subject of controversy. This report represents a review of the record as found particularly in the memoirs of Truman, Stimson, McCloy, Byrnes, Leahy, Compton, the history of the Army Air Forces, and the story of Adm. (then Capt.) Ellis M. Zacharias, who was in charge of psychological-warfare broadcasts to the Japanese.

It is not easy now to recreate the wartime emotional mood of those in command of the Japanese and American governments. This war had been ruthless, from the beginning shock of Pearl Harbor and the horror of the Bataan Death March. It had been a long and painful road through the bloody swamps of Guadalcanal and the other bitter islands, culminating in the smoking cities of the Empire. The ruthlessness and the length of the war made it difficult for either side to visualize sitting down to build a peace with the other side, and, further, there were two irreconcilable attitudes maintained by the two opposing forces.

On one side was an alliance that had mobilized for a goal of unconditional surrender. On the other side was a power that in peace or war held a religious veneration for the head of its government. The Japanese could not imagine a world in which their institution of Emperor would be abolished. Nor could they have visualized Admiral Halsey, in the terms of his boast, "riding the Emperor's white horse down the streets of Tokyo." In this year of 1945 the Japanese had seen Germany and Italy bombed and defeated. They had seen Mussolini lynched, and Hitler a suicide, his body burned and lost in the ruins. The Japanese people simply could not think how their war might end.

The American people fully expected the Japanese Emperor to be overthrown and at least imprisoned, if not in fact executed as a war criminal. Of course, many prominent Americans were counseling against any such program. Joseph Grew, as we have seen, did his best to persuade the President, and Stimson notes that Grew and others were then being "roundly denounced as appeasers." Stimson, McCloy, and others agreed with Grew, however. And the subject was publicly discussed: For example, the Washington *Post* during this period was editorializing on unconditional surrender and the wisest ways of bringing the war to an end. But the Japanese government had a clear impression that the absolute and utter leveling of their government was the unalterable goal of the American people. Many times the Japanese rulers had made clear that they could never accept this, even unto the death of millions of their people in their own countryside.

This was the basic, apparently irreconcilable, situation as our land, sea, and air forces met daily in bloody combat.

To this situation the bomb added certain X factors of technical power. But our leaders did not feel certain of the effect this new weapon would have in terms of psychological power—*i.e.*, political power.

Could this "X" force the Japanese to "bow to the inevitable?" Had the Japanese already tried to surrender?

The Japanese Emperor had spoken to his cabinet on June 20, suggesting that they make ready an emergency plan for surrender. But that did not mean that most of the top rulers of the country were prepared to seriously consider such an alternative. There was, in fact, a split between the militaristic group that ran Japan and the Emperor and those close to him.

And it was only natural that the Japanese should be divided among themselves, or even within themselves. Even before June 20 there had been peace feelers out of Japan. But there had been no really clear-cut move.

In late May a prominent Japanese newspaperman, who had left Berlin before the final disaster, had sent messages to Foreign Minister Togo urging him to make peace overtures to avoid Germany's fate of having her cities blasted to bits. This newspaperman, Jiro Taguchi, even approached the United States minister in Switzerland, Leland Harrison, and offered to find neutral intermediaries to work out a peace. Japanese businessmen in Bern supported Taguchi

(Continued on following page)

in his proposals. But these were still unofficial overtures. No matter what Japanese private citizens might wish, and no matter what they truly said about the uselessness of further destruction, their government continued to fight—and to inflict great damage upon us.

We were winning, but we were not coasting. Japan was losing the war, but she was not passive. She was wounding us, and this remained a costly and deadly war.

In April and May Japan sent peace messages or peace propaganda over her radio, and she also sent messages through the Vatican (which acted merely as a transmittal agency). Our diplomatic and intelligence people went over every statement line by line, seeking to understand the true intentions of the Japanese. One verdict was that Japan's "line" was much too ambiguous. As one observer put it, the messages blew "hot and cold . . . today protesting Japan's determination and strength and tomorrow admitting complete exhaustion and failure." A "peace" message read today, when Japan and the United States are at peace, seems quite clear. But when, as was then the case, the overture for peace was sandwiched in between messages of defiance and accompanied by military action that hurt us, it did not seem so clear.

At the end of June a new Japanese Premier, Admiral Suzuki, made a speech to the Japanese parliament, the Diet, in which there were many undertones indicating a recognition that they were in a desperate situation and might think of surrender. It was also clear that he meant to be overheard by the world.

But what was his meaning?

> As bold as it may seem [the Premier said], I firmly believe there is no one in the entire world who is more deeply concerned with world peace and the welfare of mankind than His Imperial Majesty the Emperor. The brutal and inhuman acts of both America and England are aimed to make it impossible for us to follow our national policy as proclaimed by the Emperor Meiji. I hear that the enemy is boasting of his demand of unconditional surrender. . . . Unconditional surrender will only mean that our national structure and our people will be destroyed. Against such boastful talk there is only one measure we must take—that is to fight to the last.

The intelligence experts read these messages as carefully as they could. And if they found them ambiguous, they might conclude that they were meant to be ambiguous—with the hope of confusing our own purposes. In our own case, we sent many messages toward Japan with the express purpose of doing just that. It was hard to arrive at truth and clarity after years of deliberate and planned confusion.

But in June the Japanese Ambassador to the Kremlin had made representations to the Kremlin, as was reported by Stalin to his fellow conferees at Potsdam. That was official.

Did the Japanese not assume that Stalin would some day enter the war? Would he be friendly to a peace move? Did he fairly put their message to the West? Why would Stalin *want* to see that war end before he had a chance to stake a claim in that part of Asia? Would he simply be relieved to find he did not have another war to fight? As early as April 5 Stalin had renounced his neutrality pact with Japan. In any case, as Stalin put it, the Japanese were not specific. As a matter of fact, they said *they wanted the West to be more specific,* to spell out just what we meant by "unconditional surrender." To Moscow on July 21 the Japanese Foreign Minister sent a message: "We cannot accept unconditional surrender under any circumstances."

(Continued on page 193)

Aerial view of Hiroshima, showing the extent of destruction that resulted from the dropping of the first atomic bomb.

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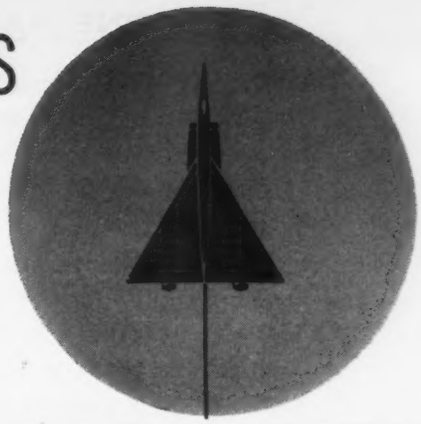

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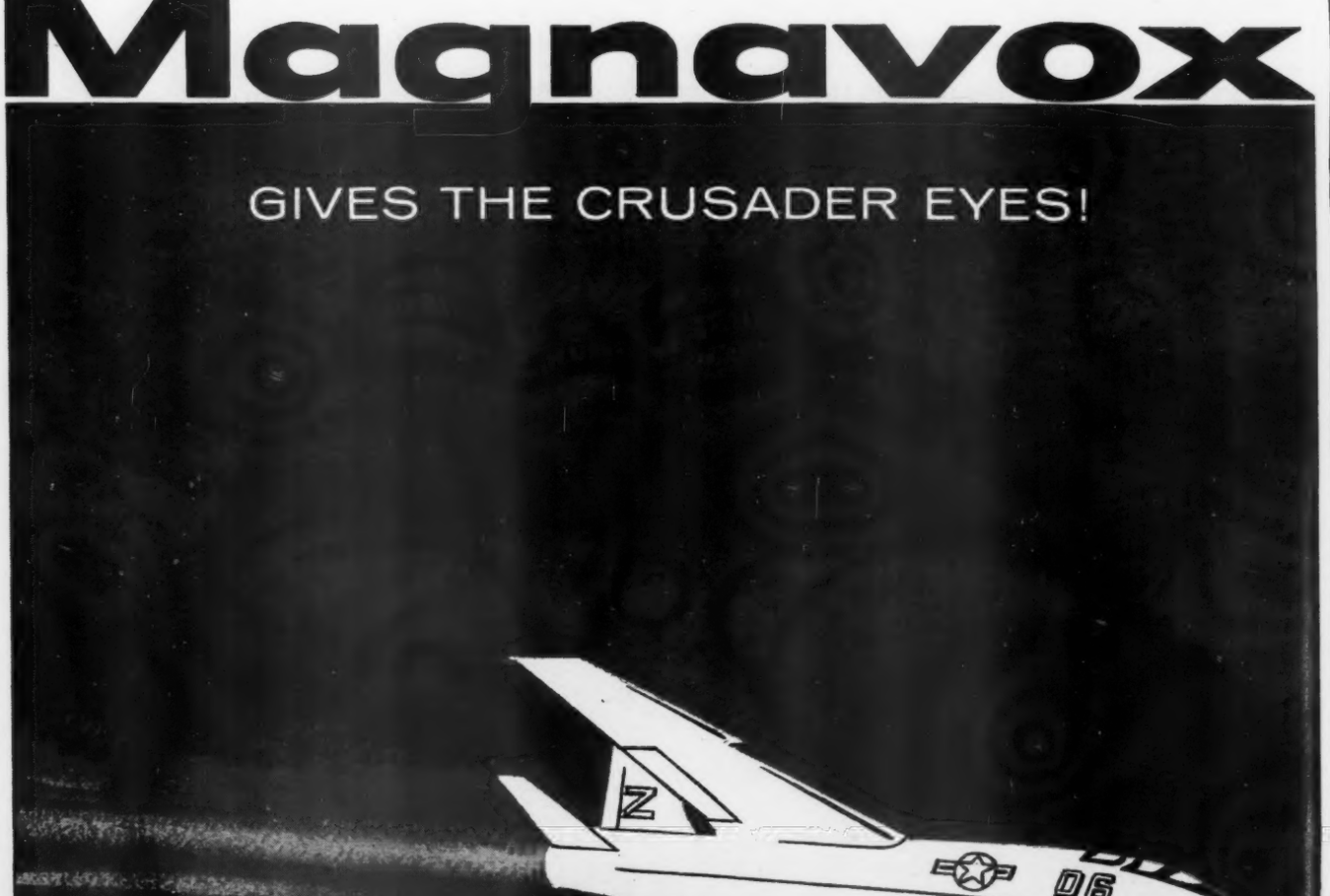

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THE MAGNAVOX CO. • DEPT. 58 • *Government and Industrial Division* • FORT WAYNE, IND.

Just what had we said about surrender, and what were we saying about it now?

Following the Potsdam Declaration, an intensive propaganda campaign had been waged by us against the Japanese. Millions of leaflets had been dropped, offering the terms we considered "honorable."

We had also named cities we intended to bomb—but we did not name Hiroshima. That was considered a prime military target, and our military did not want the soldiers to flee. Our intelligence had reported on August 5 that 40,000 troops had just moved into the military headquarters there. Even now, many years later, there is no agreed figure on how many military personnel were killed, and there is still great disagreement as to how many thousands of civilians were killed. There was some agreement that at least 100,000 persons were dead, missing, or fatally injured after the Hiroshima bombing. But the last official United States figure says that only 3,243 soldiers were killed, while a Japanese source says it was more like 40,000.

In any case, no one who knew the facts could doubt that here one bomb had destroyed one city.

Once again we dropped millions of leaflets. This time we said:

TO THE JAPANESE PEOPLE

We are in possession of the most destructive explosive ever devised by man. A single one of our newly developed atomic bombs is actually the equivalent in explosive power to what 2,000 of our giant B-29s can carry on a single mission. This awful fact is one for you to ponder and we solemnly assure you it is grimly accurate.

We have just begun to use this weapon against your homeland. If you still have any doubt, make inquiry as to what happened to Hiroshima when just one atomic bomb fell on that city.

Before using this bomb to destroy every resource of the military by which they are prolonging this useless war, we ask that you now petition the Emperor to end the war. Our President has outlined for you the thirteen consequences of an honorable surrender. We urge that you accept these consequences and begin the work of building a new, better, and peace-loving Japan.

You should take steps now to cease military resistance. Otherwise, we shall resolutely employ this bomb and all our other superior weapons to promptly and forcefully end the war.

While these leaflets were raining down on the Japanese, we also delivered some regular bombing attacks. The day after Hiroshima, a 131-plane mission struck Tokokawa. And, to keep on the alert, the 509th [Composite Group, the specially trained B-29 unit that had dropped the bomb on Hiroshima] was also ordered to fly more practice missions and to drop more "pumpkins" [nickname for the peculiarly shaped, pumpkin-colored, 10,000-pound projectiles, filled with TNT, that were designed to fall the same way as the A-bomb did. These pumpkin bombs were dropped on a number of Japanese cities in practice missions before Hiroshima.]. The 509th had plenty of pumpkins, but it did not have plenty of the new bombs. We did not, in fact, have at hand the means to follow up what we threatened, i.e., that we could "resolutely employ this bomb. . . ."

However, the Japanese had no way of knowing that we had made only three atomic bombs and had exploded two of them, one in a test and one in action. Indeed, we later secured evidence that their high command did in fact assume that we had a supply and could do as we said.

But the Japanese still hesitated to surrender, unconditionally.

Admiral Zacharias has stated many times his belief, as he put it in his book *Secret Missions:*

> If the detailed interpretations of the unconditional surrender formula had been forthcoming in June rather than at the end of July, the war would have ended without Soviet participation and before the dropping of the atomic bombs on Hiroshima and Nagasaki.

Zacharias, in his broadcasts and through other means he took to reach Japanese leaders, said:

> The Japanese leaders face two alternatives. . . . One is the virtual destruction of Japan followed by a dictated peace. The other is unconditional surrender with its attendant benefits as laid down by the Atlantic Charter.

But the difference between "dictated peace" and "unconditional surrender" did not, then or now, seem as wide as the Pacific.

Zacharias told the Japanese:

> I know that unconditional surrender is a technical term which refers to *the form in which hostilities are terminated.* On the other hand, you know that the exact conditions of the *peace* are something to be settled in the future. Japan must make the next move.

Zacharias in another broadcast said that the Japanese themselves, and not the Americans, had introduced the idea of unconditional surrender into the war. He said that General Yamashita at Singapore and General Homma in the Philippines had used such surrender as an instrument for "imposing submission and humiliation." But, he emphasized, "no such motive prompts the American peace formula."

But that summer, and in this first week of August, the Japanese did not seem to believe our broadcasts. Nor did they seem to understand other conciliatory words. They seemed only to hear the two fatal and unconciliatory words, and they felt the force of the continued bombings.

A member of the Japanese Foreign Office, Toshikazu Kase, in recounting the surrender story, has described the maneuvering going on behind the scenes in the Emperor's government. Kase attended key cabinet meetings seeking the final decisions of the war.

According to him, the Emperor and some advisers were already in a mood to negotiate and face surrender, but a militaristic faction was in control of the conduct of war and home-front information. Kase is supported by Gen. Douglas MacArthur in the view that there was actual danger of an open split or a revolution in which the civilian government would have lost control and the Army would have fought on fanatically.

According to the United States Strategic Bombing Survey, which studied the surrender story immediately after the war's end, the Emperor, *before Hiroshima,* was disposed to accept the terms of the Potsdam Declaration. According to Kase, the militarists even deleted some of the "honorable terms" of the Potsdam Declaration before they released the Declaration to the Japanese people. Thus the Emperor was not at all the dictator Mussolini and Hitler had been, but was to some extent the prisoner and captive of the war party in Tokyo. At the same time his protection was a supreme goal of his people. Hirohito at this moment appeared more of a symbol than the source of power.

So in this anomalous situation, the bomb was a symbol of an end to war, but it was not yet ending *this* war.

(Continued on following page)

The Japanese Supreme War Direction Council had to decide, on behalf of Japan, whether, or how, to end the war. This group consisted of three civilians and three military men. The latter were the War Minister and the two Chiefs of Staff.

The Foreign Minister advocated surrender, subject to one condition: keeping the Emperor.

The War Minister and the two Chiefs wanted to add other conditions: no occupation, no punishment of war criminals except by the Japanese government, and others.

Meanwhile the entire world was discussing the atomic bomb. Around the globe, politicians and priests—and generals—were saying that this final weapon meant an end to this war and all wars. But Japanese leaders, not without reason, felt they still could not agree on a program which could be accepted both by the Allies and also by the Japanese people.

At midnight on August 9 the Council held what was its most fateful meeting. The Emperor attended the meeting, but he did not preside, and his attendance was considered more or less ceremonial. The Chairman was Admiral Suzuki, a man who had the difficult task of trying to mediate between the military and political wings of the battered government of Japan. This night they were evenly divided.

While they met, another word, like "uranium," was being added to the world vocabulary of the new age.

On land, on sea, and in the air the war went on. The 509th had further refined its operating procedure on August 8, when it made a practice strike over the Empire and once again dropped pumpkin bombs.

The 509th was not scheduled to make another atomic-bomb strike until after August 11. But on Tinian the weather experts felt that they saw a bad Pacific storm on the way. The consensus was that the 509th had better fly now or they might not be able to fly for an indefinite period.

So on the 8th it was pumpkins, but the next day a new and more deadly thing was in a plane from the 509th, over the city of Kokura. This was the number-two city, and about 0930 on August 9, the plane made three passes over Kokura. Each time the pilot could not even see the city under the clouds, and the bombardier could not make the visual sighting demanded of these missions.

The plane—it was named after Capt. Frederick C. Bock, and was called *Bock's Car*—gave up on the number-two city and headed for number three. That city, too, was overcast, but the bombardier found a hole in the clouds. He flipped the switch.

At 1058, August 9, the equations again proved correct. Mass was converted into energy into blast. Plutonium—that was the new word—plutonium was converted into radiation, into heat, and into light, blinding light.

That was Nagasaki. . . .

* * *

Some who think the human race can survive Hiroshima feel that Nagasaki was the fatal mistake that our race will not survive. Mistake it may have been, but apparently it was not an accident. Nagasaki was part of the design, according to official accounts.

The original plan had called for a list of five cities. The report in December, before Yalta, had said there would be a bomb, then another bomb sometime later, then others more frequently thereafter. However, it was to be many months before it could be announced that bombs were being made "on a production basis." Most records are still secret, and in the reports so far made public there is no hint that the 509th ever expected to have another bomb after Nagasaki. There is no record that Truman was personally informed of the bomb production rate, or told that we had only two bombs. It does not seem likely that precise reports would have been given to him at the time.

Truman, some years later, recalled that from the *Augusta* he had given an order for *two atomic bombs* to be dropped.

Further, the idea that Japan should be threatened with a series of bombs was part of our policy at this time.

The announcement of the bomb, prepared before it was even known that Hiroshima would be the fatal city, had been designed to broadcast that threat as soon as the bomb was dropped. In that announcement Truman had said to Japan and the world:

> It was to spare the Japanese people from utter destruction that the ultimatum of July 26 was issued at Potsdam. Their leaders promptly rejected that ultimatum. If they do not now accept our terms, they may expect a rain of ruin from the air, the like of which has never been seen on this earth.

As Japan's Supreme War Direction Council met with the Emperor on August 9, they had just received the word of Nagasaki.

They were also reeling from the news that the Soviet had entered the war the night before. The Russians were moving into Manchuria; their guns and propaganda machinery were proceeding in a massive mobilization.

The Japanese War Minister still held his bloc together. They did not want to surrender. The meeting was deadlocked. Premier Suzuki would not break the tie by voting himself. It remained three to three. The split remained hopeless until 2:00 a.m. the following day.

Kase, an eyewitness, tells what happened then. Admiral Suzuki rose to his feet and quietly said:

> Gentlemen, we have spent hours in deliberation without coming to a decision and yet agreement is not in sight. You are fully aware that we cannot afford to waste even a minute at this juncture. I propose, therefore, to seek the imperial guidance and substitute it for the decision of this conference.

This was the first time the Emperor had been called on for an active part in such councils. He responded with decision.

He said there was but one choice before him: "to call a halt to the war and accept the Allies' terms, bearing what was indeed very hard to bear."

A message accepting the Potsdam Declaration was prepared. But there was still one condition attached: that the Emperor be kept, i.e., that the surrender treaty did not contain "any demand which prejudices the prerogatives of His Majesty as a sovereign ruler."

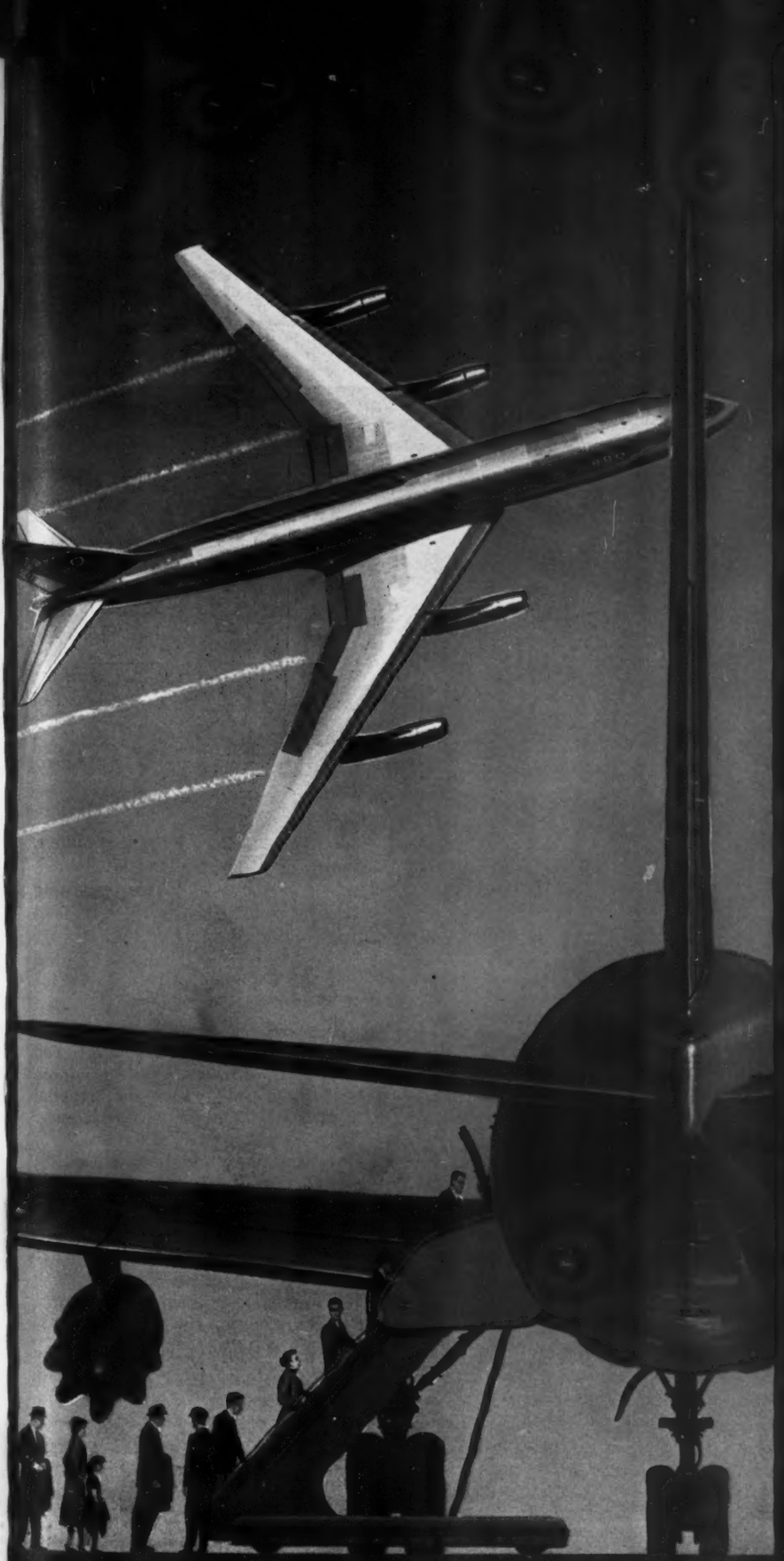
When acceptance of the Potsdam terms was announced on the Japanese radio, the Japanese military were angered, and Japan was quite close to revolution.

And in Washington the American high command also hesitated.

At 7:30 a.m. American radio monitors heard the news, as given to the Japanese. President Truman called a 9:00 a.m. meeting in his office to consider whether we could accept this conditional acceptance. Attending were Leahy, Byrnes, Stimson, and Forrestal.

Since Stimson had always felt we should let the Japanese keep their Emperor, he repeated it that morning. Leahy agreed, if for no reason other than the Emperor's usefulness in effecting an orderly surrender. Forrestal proposed a delicately worded reply, which would accept but still insist that the purposes of the Potsdam Declaration were to be accomplished.

(Continued on page 197)



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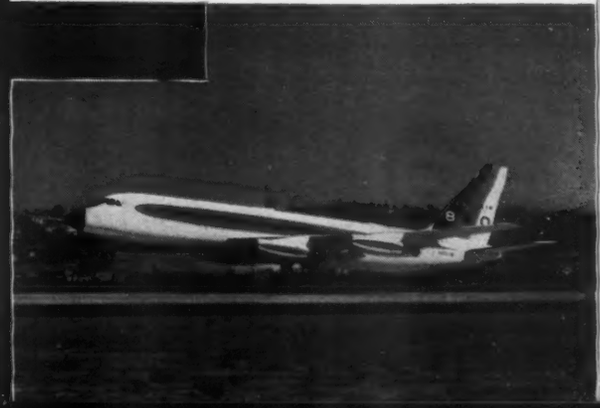

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Byrnes leaned toward the idea of unconditional, unequivocal surrender.

The President asked Byrnes to draft a reply along the lines proposed by Forrestal. This was done and submitted, with all possible speed that same day, to the President and then to our Allies, Britain, China, and Russia.

Our reply said that "the authority of the Emperor and the Japanese Government . . . shall be subject to the Supreme Commander. . . ."

There was another provision—that the Emperor would be required to sign the surrender terms—but the British thought this unwise, and it was changed to read, "The Emperor will be required to authorize and ensure the signature. . . ."

That message was sent through Switzerland the next day, August 11.

Meanwhile the war went on, and Adm. Chester Nimitz sent an order to all of the Pacific fleet that the proposals and counterproposals "must not be permitted to affect vigilance . . . neither the Japanese nor Allied Forces have stopped fighting. . . . Offensive action shall be continued. . . ."

August 12 was a Sunday, but all day the President and Secretary Byrnes, often joined by members of the high military command, waited nervously for a Japanese answer. It did not come that day or the next.

In Japan the Emperor wanted to accept the American reply, but the Japanese military was ablaze. A military group was planning a coup d'état, thinking of capturing the Emperor and his entire cabinet and planning to continue all-out war.

The rebels bombed the residence of the Foreign Minister, who had led the surrender wing. But the cabinet formally ratified the Emperor's decision on the afternoon of August 14. Then a group of Army rebels actually gained control of the Palace. They were looking for a phonograph recording—the first the Emperor had ever made—which was to be played on the Japanese radio, announcing Japan's defeat. They did not find the record.

Amid such confusion the final Japanese message was sent through Switzerland to Washington and delivered to Secretary Byrnes by the Swiss Chargé d'Affaires:

"His Majesty the Emperor has issued an imperial rescript regarding Japanese acceptance of the provisions of the Potsdam Declaration. . . ."

This message, like ours, to which it replied, implied that the Emperor would be the head of government for an unspecified time. The two statements, masterpieces of calculated ambiguity, did not say the Emperor would stay and did not say he would go. The Japanese reply did not state any conditions, but still it did not say they surrendered unconditionally. Yet that was implied by acceptance of the Potsdam Declaration.

That night the President gathered the White House correspondents and announced that the war was over. The news went immediately to the crowds gathered in downtown Washington and in all the major cities of America. The V-J celebration went on through the night.

Said the President, "I deem this reply a full acceptance of the Potsdam Declaration which specified the unconditional surrender of Japan. In the reply there is no qualification."

It was done.

• • •

The two cities of Hiroshima and Nagasaki lay flat and black and still. There was very little movement, except where some remains of the great fires still smoldered.

Some Japanese survivors who had apparently been uninjured still walked around. They did not realize that they would be dead shortly, that within them there still smoldered the effects of invisible radiation. Unknowingly, these walking dead thought the bomb was finished. They did not know that in one way—physically—it would *never* be finished, that many who survived would transmit defects to generation upon generation.

Smoke billows up over Nagasaki in the now-familiar mushroom cloud as history's second atomic bomb is dropped.

This genetic effect was an unknown factor in the bombs, a symbol of the other unknown factors—the social and political effects that these actions were to have upon the life of man.

All over the world men and women breathed a sigh of relief. We had closed a door upon a war, but we opened many other doors, leading to other perils and promises, known and unknown. But all this was secreted in the most secret place known to man—tomorrow. Without warning we began the atomic world.

At the moment, all around the world, millions of men and women were celebrating the end of the war. For the first time in years most of the world's soldiers could plan for the quiet of peace.

Millions were shocked at the surprise we gave the Japanese, but few men knew of the other surprises which radiation and the bomb would have for all of us. Whether they were asleep or shocked awake, all men through these events had moved from the shadow of the war to the shadow of the bomb. In this way we began the atomic world in which our children and their children must find their way.—END

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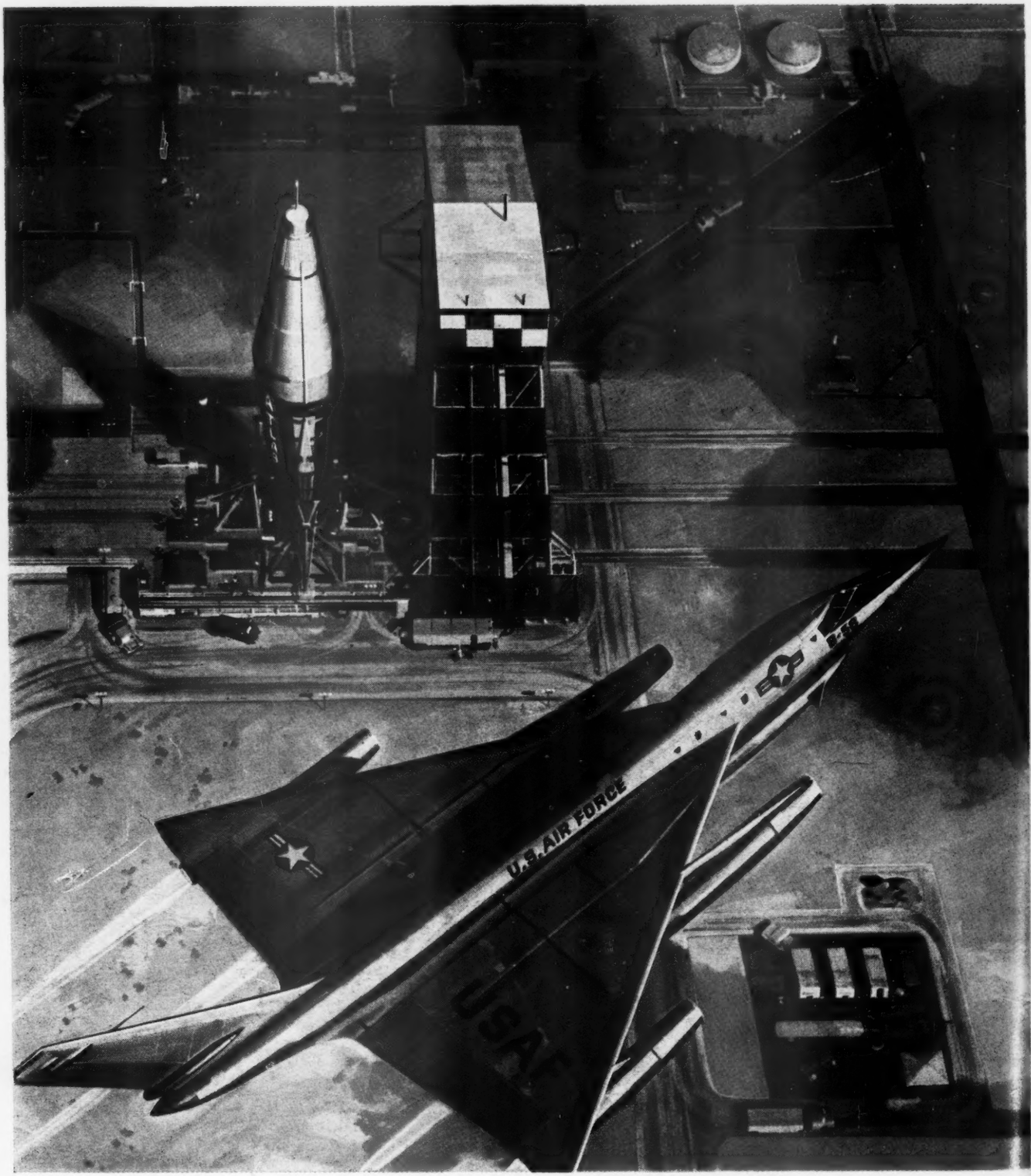

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